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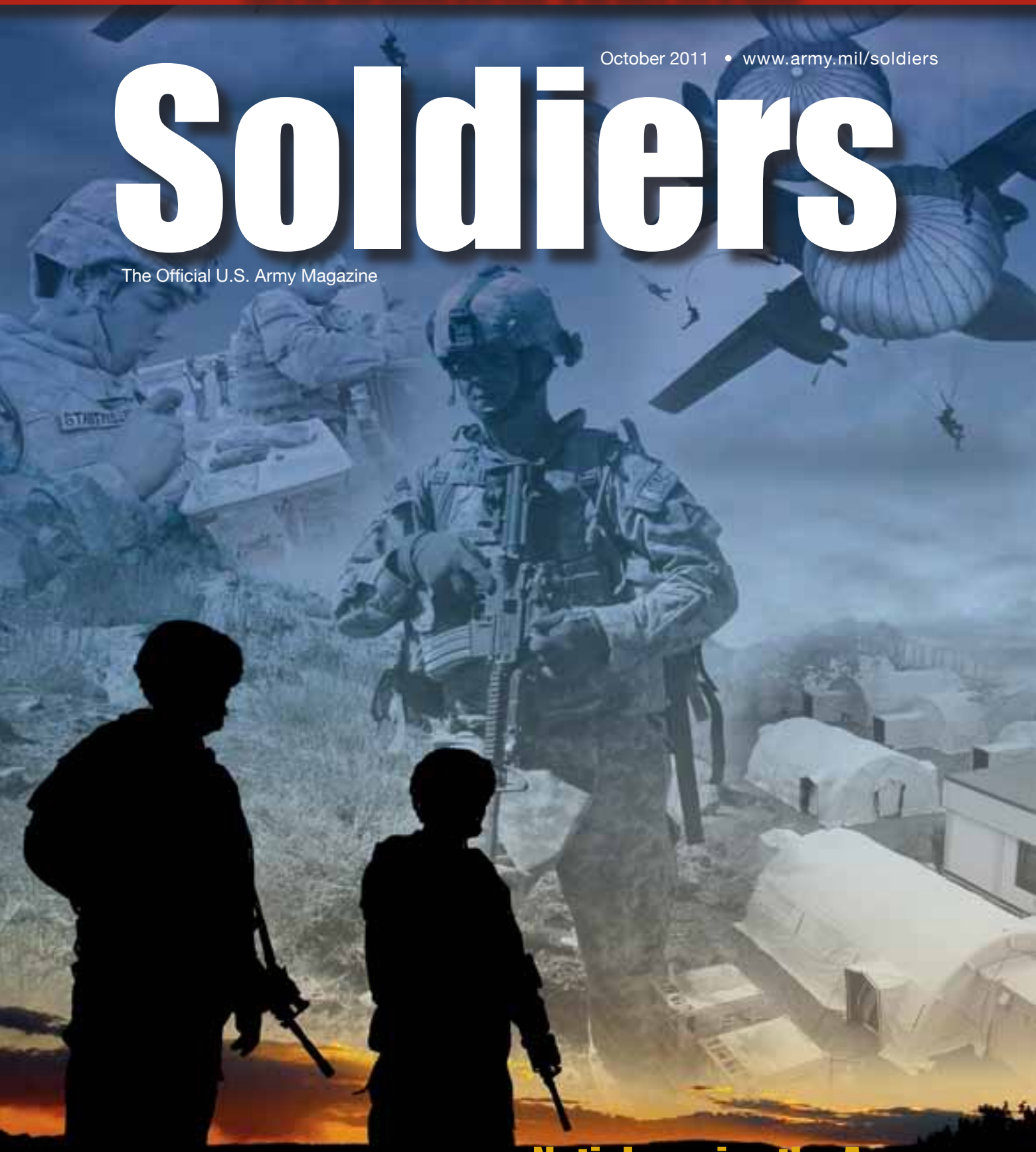
October 2011 • www.army.mil/soldiers

Soldiers

The Official U.S. Army Magazine



Natick equips the Army

Science behind the Soldier • Going to extremes—indoors • Shelter for Soldiers • Sky's the limit • Pocket sandwiches • 'Ironman' • Feedback from the field

U.S.ARMY

Soldiers

October 2011 • VOLUME 66, NO. 10

A female Airman braces against the cold in the Doriot Climatic Chamber at Natick Soldier Systems Center. See story on page 8. (Photo by David Kamm)

[On the Cover]

Natick equips the Army. Cover design by Philip Fujawa. Silhouette image by David Kamm/center image by Staff Sgt. Adam Mancini.

[Coming Next Month]

Soldiers goes online. In November, find stories honoring veterans at www.army.mil/soldiers.

A Soldier rehydrates after walking on a treadmill during a study conducted in the Doriot Climatic Chambers at Natick Soldier Systems Center. See story on page 8. (Photo by David Kamm)

October 2011

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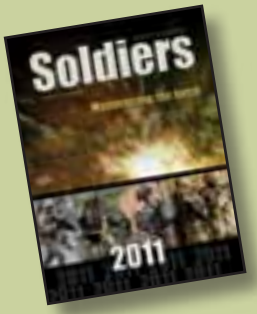

The October issue of Soldiers will be the final monthly print issue. To access future content, visit www.army.mil/soldiers. Fan Soldiers on Facebook at www.facebook.com/SoldiersMag, or follow @SoldiersMag on Twitter for updates and information about our transition from print to web.

October is our final monthly print issue

Soldiers

The Official U.S. Army Magazine

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October 1, 2011

Dear readers,

As you may know, this issue is the final monthly print issue of Soldiers magazine. Although the magazine will exist in an online-only format, it is with a bit of sadness that we say farewell to the Army's flagship publication.

Since it was first published by the War Department as the Army Information Digest in May of 1946, Soldiers has served as a means to inform and entertain millions of readers worldwide. Despite its impending evolution, I am confident that the magazine will continue to feature the same quality, relevant content it has consistently published for more than six decades.

I encourage you to visit the magazine's current webpage at **www.army.mil/soldiers** throughout the transition from print to Web. You can also fan Soldiers on Facebook at **www.facebook.com/SoldiersMag** or follow **@SoldiersMag** on Twitter to stay abreast of changes to the magazine's Web presence.

It is my hope that this transition will help expand the Army's communication capabilities so that Soldiers magazine can share the Army's stories with an ever-growing audience.

Sincerely,

Carrie L. McLeroy
Editor in chief

The Natick Soldier Systems Center

Simulations provide valuable data on Soldier performance at the Natick Soldier Research, Development and Engineering Center. (Photo by David Kamm) (Top left) The Natick Soldier Systems Center occupies 78 acres on a small peninsula on Lake Cochituate in Natick, Mass. (Photo courtesy of NSSC)

Story by John Harlow

THE Natick Soldier Systems Center provides the science behind the Soldier.

It's the only place in the world that is totally focused on the Soldier. This is what the folks at the NSSC in Massachusetts focus on every day. They answer questions like, "How can we give Soldiers all the nutrients they need while operating at high altitudes in the mountains of Afghanistan," and "How can we lighten the load of a foot Soldier on patrol in Iraq?" At Natick, it's all about the Soldier.

The four tenant units at Natick—the Natick Soldier Research, Development and Engineering Center; the U.S. Army Institute of Environmental Medicine; Program Manager Field Sustainment and the Integrated Logistics Support Center—provide Soldiers a broad range of support. If a Soldier wears it, eats it, sleeps under it or has it airdropped to them, it is researched and developed on the 78-acre campus.

"We're excited to show the work we do for the Soldier to the Soldier," said Brig. Gen. John McGuiness, the commanding general of NSSC. "There are projects we are working on here that are already in theater to help make things easier on our Soldiers."

It is the NSRDEC's mission to maximize the warfighter's survivability, sustainability, mobility, combat effectiveness and field quality of life by treating the warfighter as a system. The NSRDEC, led by Dr. John Obusek, adds value to the Soldier through technology generation, application and transition, enabling rapid fielding of the right equipment, Soldier systems technology integration and transition, and the ability to solve field problems quickly.

The USARIEM, led by Col. Gaston Bathalon, conducts biomedical research to improve and sustain warfighter health and performance under all imaginable conditions. It is internationally recognized as both the center of excellence for warfighter performance science and useful applications, and a world-class laboratory for

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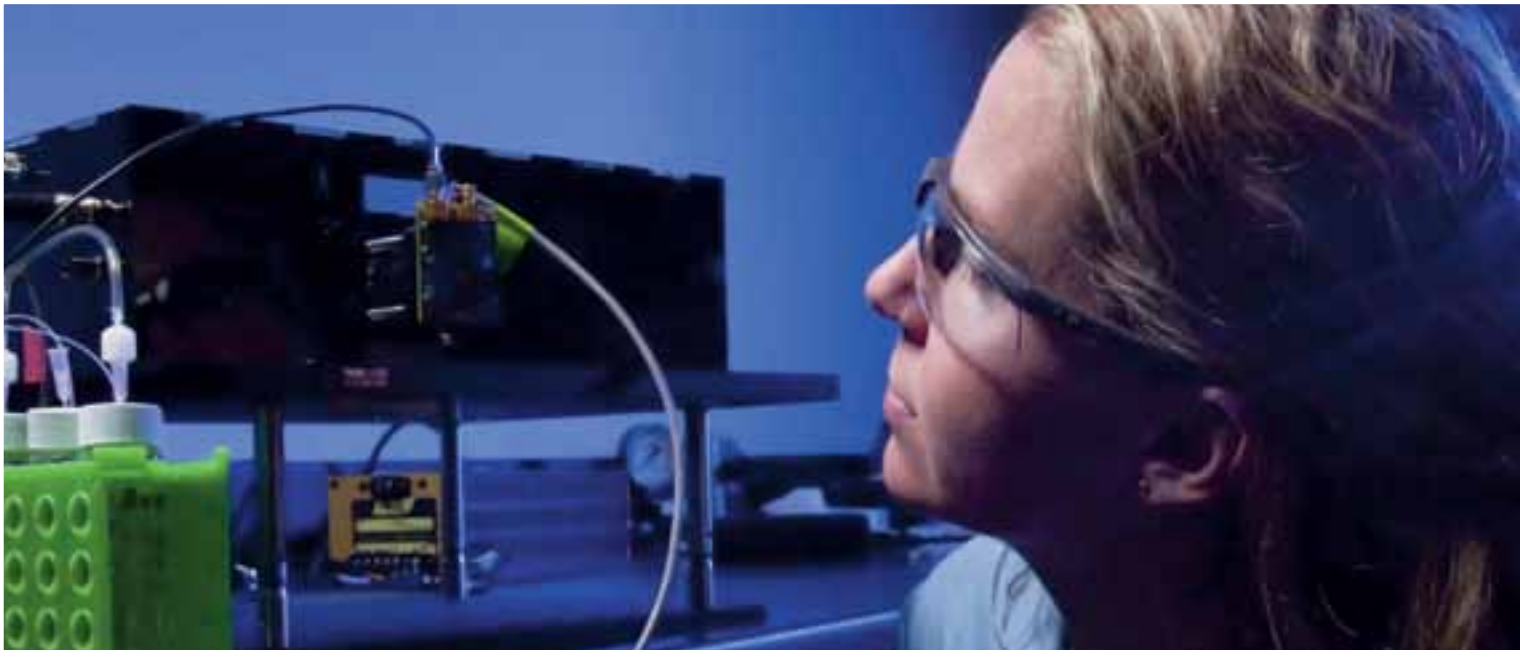


The workforce at Natick Soldier Systems Center includes a highly educated team of professionals with specialities ranging from aerospace to zoology. (Photo by David Kamm)

environmental medicine, physiology, performance and nutrition research.

"USARIEM serves a unique role in the Department of Defense," said Bathalon. "In no other single location will you find the collection of expertise in Soldier performance and sustainment that we maintain here at Natick. The work conducted by the professionals here helps Soldiers in every aspect of their daily lives, from the food they eat, to the way they exercise, to the uniforms they wear and the equipment they carry.

"Ultimately, our presence and the work we do is a testament to the commitment of the Army and the Department of Defense to the welfare of our servicemembers. And USARIEM's outstanding scientists, Soldiers and support staff (are) proud to be engaged in supporting that mission."

The ILSC, led by Michael Ahearn, provides innovative, robust and streamlined total life cycle logistics and materiel readiness support to warfighters throughout the DOD.

"The ILSC's acquisition and technology partners at Natick develop the most advanced warfighter technologies ever fielded," said Matt Cooke, Team Leader, Soldier Support Systems, TACOM ILSC. "Without proper logistics, however, those technologies are unsupportable in the field and would thereby be quickly rendered useless. The ILSC creates synergy with its acquisition and technology counterparts at Natick by developing and providing cost effective and efficient logistics support throughout every phase of a weapon system's life cycle.

"ILSC logisticians begin working on new acquisition programs prior to milestone A, contributing to the development of requirements documents and life-cycle sustainment plans," Cooke continued. "As systems are developed and fielded, the ILSC continues to partner, ensuring that all logistics elements are in place throughout the life cycle. The ILSC also procures and distributes both the end item and spare parts directly to the warfighter. This enables Natick-developed equipment to be supported and sustained for the duration of its life cycle, maximizing Soldier lethality and survivability."

Three PMs conduct business at Natick. Product Manager Soldier

Flame-resistant materials for uniforms are evaluated at the Natick Soldier Research, Development and Engineering Center's Thermal Test Facility. (Photo by David Kamm)

Clothing and Individual Equipment provides comfortable uniforms that enhance mission effectiveness. These products protect against manmade threats such as fire and biological/chemical agents, as well as environmental threats such as extreme weather conditions. PM-SCIE also provides improved parachute systems.

Product Manager Force Sustainment Systems enhances the combat effectiveness and quality of life for the Soldier by providing equipment, systems and technical support to sustain and improve the environments in which they live, train and operate.

Program Manager for Special Operation Forces Survival, Support and Equipment Systems is a full-service program management office that manages the development, acquisition and fielding, and full life-cycle sustainment of SOF-unique individual equipment to ensure the success of the joint unconventional mission.

NSSC also houses the U.S. Navy Clothing and Textile Research Facility and the Coast Guard Clothing Design and Technical office, as well as members of the Air Force and Marine Corps.

Nearly 2,000 employees conduct research, development, acquisition and sustainment to maximize combat effectiveness and survivability of servicemembers. The employees are focused daily on making the world better for Soldiers. The people who comprise the center's workforce are professionals in fields ranging from aerospace to zoology, and hold a combined 103 doctorates, 198 masters' and 312 bachelors' degrees, and two are medical doctors.

The center not only uses the resources of its highly educated workforce to better equip Soldiers, it collaborates with the education centers surrounding the installation: More than 200 accredited academic institutions in New England partner with the NSSC to support servicemembers. The economic impact in the Boston area is nearly $400 million.

The facilities at NSSC are unique and highly specialized. On the small peninsula, you can find the Doriot Climatic Chambers, Altitude Chamber, Hydro-Environmental Chamber, Soldier Performance Science Center, Biomechanics Lab, 3-D Anthropometric Lab, CIE Fightability Course, Bone Health Lab, Materials Science Lab, Camouflage Analysis and Demo Lab, Airdrop Certification Test Facility, Textile Testing facilities, Thermal Test Facility, High Performance Fiber Facility and Polymer Film Center of Excel-

The Natick Soldier Systems Center not only uses the resources of its highly educated workforce to better equip Soldiers, it collaborates with the education centers surrounding the installation. There are 226 accredited academic institutions in New England that partner with the NSSC to support servicemembers.

The Natick Soldier Research, Development and Engineering Center seeks to encourage the next generation through participation in the Science, Technology, Engineering and Math Program. (Photo by David Kamm)

lence, where research results in superior technology for the warfighter.

Not only is NSSC committed to providing today's Soldiers with the best equipment possible, its professionals also keep their eyes on the future. Through the Science Technology Engineering and Math outreach partnership, NSSC has partnered with the Massachusetts Governor's Council, MetroWest STEM Education Network, Massachusetts High Tech Council Initiative, Navy and Air Force Outreach, Federal Laboratory Consortium, the Women in Science and Engineering program and the MassBioEd Foundation to bring in the next generation of engineers to support Soldiers of the future. ❖

John Harlow works for U.S. Army Garrison-Natick public affairs.

Going to extremes

without going outside

Story by Bob Reinert
Photos by David Kamm

SO you like to go to extremes. The Natick Soldier Systems Center has just the place for you: the Doriot Climatic Chambers.

What climate in the world would you prefer to experience? Doriot can give you temperatures from minus 70 to 165 degrees, winds up to 40 mph, humidity from 10 to 90 percent or—grab your umbrella—as much as 4 inches of rain per hour. Varying amounts of sunshine can be simulated by six rows of 250-watt light bulbs.

It's all done to help improve the performances of people and equipment with the goal of making life better for Soldiers in the field.

"This building is designed to mimic every environment on the face of the planet and some places a little bit further," said Col. Keith L. Hiatt, until recently the medical director of the U.S. Army Research Institute of Environmental Medicine at Natick. "There's a lot of places that have chambers, but I think these are the only man-rated chambers, rated to be safe enough to put human beings in."

While USARIEM uses Doriot to study Soldier physiology, the Army Materiel Command directs its efforts toward testing everything the Soldier wears and uses. As Hiatt pointed out, however, crossover does occur during research in the chambers.

"This is a nice marriage between Army Materiel Command and Medical Research and Materiel Command,

A cold-weather garment test in the Doriot Climatic Chambers produces frost on the faces of test subjects who brave temperatures as low as minus 40 degrees.

because we're both on the same post," Hiatt said. "We're working together on a lot of things. They do the 'skin out.' We do the 'skin in.' It's a nice marriage, because that's the total Soldier."

Doriot has been a one-of-a-kind facility since its doors first opened in 1954 during the height of the Cold War. Back then, the next conflict seemed likely to take place in Europe. Now Americans are fighting in Southwest Asia, under entirely different climatic conditions.

For nearly six decades, Doriot has allowed scientists to observe how people and equipment perform in nearly any environment imaginable without the need of costly field testing. The folks at Doriot can simulate pretty much anything.

"To do even a weeklong study somewhere, the cost is astronomical," said Josh Bulotsky of Natick Soldier Research, Development and Engineering Center, the chambers manager. "You come here, and everything's here for you. It's all set up. It's ready.

"It's not like you're in the field and you have no support. It's just a better way to do it. You do your testing. You have your data. There (are) no outside variables at all. You have such a consistent temperature and humidity range."

This doesn't mean it will be comfortable inside the chambers during studies and testing. "If you go in there and it's minus 50 or minus 60, and there's no wind, it's really not that cold," Bulotsky said. "But the minute that you even turn the wind up to 10 miles an hour, you immediately give them a risk of having some serious frostbite."

Through studies and tests at Doriot, however, researchers have learned how to protect servicemembers from such brutal conditions. "We actually did a study with some SEALs about two and a half years ago, where we put them in there with some (clothing)," Hiatt recalled. "And they were at minus 70 with about a 30 mile-an-hour wind, and they were warm."

The two 60-by-10-by-15-foot chambers make this research possible. One chamber can produce arctic conditions. The other can transport you to the tropics, even in the middle of a harsh New England winter. The ample size of the chambers allows for the testing of larger pieces of equipment, such as parachutes or windmills.

"It's a unique facility," Hiatt said. "It's basically a wind tunnel."

In physiological studies conducted at Doriot, human research volunteers—Soldiers temporarily assigned to Natick after Advanced Individual Training—are subjected to heat and cold extremes, and their adaptability is measured. New clothing items are also tested for their warming or cooling properties.

"If it wasn't for the HRV program, we wouldn't be here," said Bulotsky, "none of us."

Hiatt agreed, noting, "The HRVs are integral. You could do a lot of stuff here without them, but there'd be an awful lot of stuff you could not do without them."

Soldiers simulate work rates in extreme conditions at Doriot by walking or running on treadmills, often with a full equipment load. Each chamber features two five-person treadmills that can be set as high as 15 mph with a 12-percent grade.

"We've done…tests where the Soldiers have walked on the treadmills for…2 1/2 hours at a time, with their full gear, trying to figure out how much water…they need to consume," Bulotsky said. "Those tests are pretty rigorous.

"Those five Soldiers are all marching at the same elevation, the same speed. They're all the same. They all are basically baselined the same."

The effects of nutrition on performance can be studied through the use of an in-house kitchen to prepare meals at Doriot, and an on-site dormitory accommodates sleep studies. Dressing rooms with shower and laundry facilities support longer studies.

"You can basically keep folks here for prolonged periods of time," Hiatt said. "We've done studies that were up to two weeks."

Hiatt pointed out that researchers closely monitor volunteers at Doriot. "We make sure that we mitigate all risks and that everybody stays safe," he said. "They're wired up like you can't imagine."

Hiatt, Bulotsky and others who work with them never lose sight of the human factor. "All the Soldiers I see come in here, the volunteers, they all give it, for the most part, their hundred percent and more," Bulotsky said. "They're in here so much, you get friendly with them. And they go off, and they get put in harm's way. It's tough sometimes."

Soldiers often return from deployments to provide comments on products they helped test at Natick that they later used in the field. "They get a lot of feedback from the Soldiers

Soldiers endure heat in the Tropic Chamber in the Doriot Climatic Chambers at Natick Soldier Systems Center, where temperatures can rise to 165 degrees with humidity up to 90 percent.

who are deployed, which is a great thing," Bulotsky said. "It's the only way, I guess, to improve your product."

Much as he would like to deploy with them, Bulotsky understands that he can accomplish more for Soldiers at Doriot. "Whatever we can do to make their lives better and safer, when we can't be over there, that's the most important thing," he said. "We're probably more (helpful) here as a whole trying to develop things for them.

"I enjoy working here. You get to definitely see results. Every day is different."

The chambers were named for Brig. Gen. Georges F. Doriot. During World War II, Doriot and the staff at the Quartermaster Corps developed clothing and equipment for Soldiers, tested them under harsh conditions and fielded the improved items as quickly as possible. After that experience, Doriot wanted a facility built to better test Soldiers and equipment.

"So after the war, it was (Doriot's) idea to come up with a facility, the 'Institute of Man,' I think it was called way back then," Hiatt said. "He wanted a place where he could simulate the worst environments on the planet, so basically from Antarctica to the Sahara Desert and everything in between."

The chambers bearing his name have more than realized Doriot's vision. They have been upgraded often over the years to ensure that they remain state-of-the-art facilities. More modernization will likely occur in advance of a future that can't be accurately predicted.

"The problem is," said Hiatt, "where we fight today may not be where we fight tomorrow." ❖

Bob Reinert works for U.S. Army Garrison-Natick public affairs.

Many studies are run in the unique Doriot Climatic Chambers at Natick Soldier Systems Center. Here, a row of volunteers test a cold-weather sleeping system.

Josh Bulotsky, Doriot Climatic Chambers manager, monitors data acquisition on test subjects inside the chambers.

The Force Provider base camp is built around 32-by-20-foot shelters composed of four inflatable air beams.

Story by Bob Reinert

PROVIDING SHELTERS

WHAT fits into one C-17 Globemaster III aircraft, will be used by as many as 150 Soldiers, and can be set up and fully operational in as little as 3 1/2 hours?

Give up? Everything one would need to set up an entire base camp. It's true, and it all came about as a result of Army shelters used and judged inadequate during Operation Desert Storm.

"It goes back to 1991," said Mike Hope, Combat Field Service Equipment Team leader for Project Manager Force Sustainment Systems at Natick Soldier Systems Center. "General (Gordon R.) Sullivan, who was the… chief of staff of the Army during Desert Storm, looked on one side and saw the Air Force living in (comfortable) air-conditioned tents, and the Army on the other side not doing so well. So he directed the development of Force Provider."

The "Force Provider" system furnishes everything those 150 Soldiers need—climate-controlled billeting, shower, latrine, kitchen, power distribution, even morale, welfare and recreation facilities. "All you have to bring is the fuel and water, and it will run," said Luz Diaz, a Force Provider project manager. "It's the Army's premier base camp for Soldiers."

At the beginning, Force Provider was designed as a 600-Soldier camp. According to Hope, 9/11 changed all that. Eight Force Provider modules were flown to Afghanistan in November 2001. "We had them right over there," Hope said. "The first thing the commanders wanted to do was break them apart to support smaller forward missions."

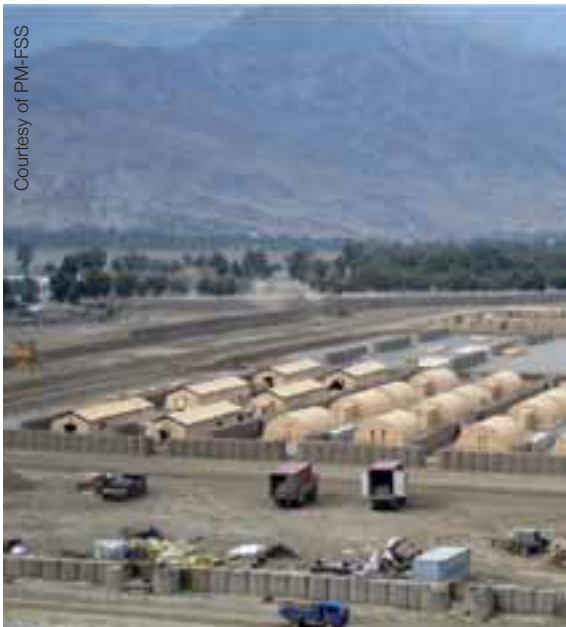
Hope's team got right to work reconfiguring Force Provider for the smaller units deployed to Afghanistan. "We packaged it so it was much more flexible," Hope said. "You can put them anywhere you want. You can send them downrange to the smallest FOB (forward operating base)—wherever you need (them)."

"The 150-man package is kind of

Each Force Provider base camp comes with everything 150 Soldiers need, including a kitchen.

Courtesy of PM-FSS

An entire 150-man Force Provider base camp can fit into one C-17 Globemaster III aircraft and be set up and operational in less than four hours.



Courtesy of PM-FSS

David Kamm

FOR SOLDIERS

tailored around a leg company, so a battalion commander doesn't have to put all his people in one place," said Lee O'Donovan, Hope's systems acquisition manager. "He can have them in four different places, and they're self-sustaining."

That 150-man camp can be established much more quickly than any other shelter systems of the past. In less than four hours, eight people can have it up and fully operational. Hope said the use of Natick-developed inflatable air beams in the tents streamlined the process.

"The set-up time was reduced dramatically," Hope said. "It used to take us seven to 10 days to house 600 Soldiers. We can do it in one day because of that air-beam technology."

O'Donovan pointed out that not much can keep Force Provider down. "You can actually unroll the air-beam tent, put the four big stakes in the ground and blow it up in a sandstorm," O'Donovan said. "It's been done. You can't do that with a temper or a frame tent."

And what about that sandstorm? Well, it would stay outside, where it belongs. "This thing is like a cocoon," O'Donovan said. "It's really nice."

A diesel compressor can inflate the four air beams of a 32-by-20-foot shelter in 10 minutes.

"Once you get it to 60 (pounds per square inch), you take (the compressor) away," Hope said. "That's it. You never come back and put air in it.

"The nice thing about that tent, though, is everything's integrated inside…so it doesn't beat the Soldier up for another hour to go back in and outfit the inside of the tent."

What happens if an air beam is pierced by a bullet? "They don't explode," Hope said. "They would leak like a tire and just deflate. It's…very, very reliable." And an air beam can be replaced in minutes.

Hope said Force Provider—50 of which are deployed to Afghanistan—can be set up just about anywhere. "The nice thing about it is it's so flex-

The Base Camp Systems Integration Laboratory at Fort Devens, Mass., is designed to improve the quality of life for deployed Soldiers.

David Kamm

ible that we could probably set it up in a hundred different configurations," Hope added.

Soldier feedback from the field over the years has spurred improvements to Force Provider. "We have (had) eight guys in theater…since (2001)," Hope said. "We have a technical assistance team. Those changes, in going to the 150-man camp and upgrading all the life-support systems, (are) really because of the TAT guys who are in theater living with the Soldier getting the feedback.

"We're passionate about…the Force Provider System, because we get to see what it does. We design it, we build it, we field it, we get to see the looks on their faces. We didn't do anything scientific. We just listened to what the Soldier had to say."

A constant goal of Force Provider is to decrease the amount of fuel and water used in basing, thereby reducing the number of costly and sometimes dangerous resupply missions to those forward bases. A new shower-water reuse system with Force Provider captures and reuses 75 percent of gray water.

"If you look at a typical 600-man camp, you use about 4.4 million gallons a year if you had 600 living there for an entire year," Hope said. "That little box will capture 3.3 million gallons of that. And if you look at the cost of water in Afghanistan right now, it could range anywhere from $15 to $30 a gallon. So it pays for itself in or about the sixth day."

The Force Provider team took its development efforts a step further this year with the establishment of a systems integration laboratory on a 10-acre site at nearby Fort Devens, Mass., where the team set up two 150-man camps. One mirrors those currently deployed to Afghanistan; the other is designed to collect data and test new technologies in such areas as micro-grid, insulation materials, lighting, gray/black water treatment and renewable energy.

"The big thing coming out of theater is we've got to look at how we're going to reduce fuel and water," Hope said. "Power grid, power management—that's big for the future. That's big because you're taking Soldiers off the road, plus the cost of the fuel, plus the maintenance and sustainment."

Some Soldiers and Marines training on the Devens ranges will live in the camps. "If we were going to look at new technologies…we wanted troop input and troops to be able to live there, and something so close to Natick," Hope said. "There (are) so many new technologies being looked at right now.

"We did make it like a realistic FOB. We duplicated exactly what you would see if you went to Afghanistan."

Data collected and new technologies tested at the Devens site will lead to future improvements in the shelter system, which has already received high marks over the years from deployed Soldiers.

"The modular capability that it provides has proven to be a force enabler from the battalion down to the company level—it takes care of our deployed servicemembers by providing for a one-stop sleep, feed, entertainment and exercise capability that means so much to each and every task force member," Lt. Col. Michael C. Lopez of Headquarters, Combined/Joint Task Force-82, Bagram Airfield, Afghanistan, wrote in a Nov. 9, 2009 letter to Kevin Fahey, program executive officer, Combat Support, Combat Service Support.

"This Force Provider System is unlike any base camp system we have in the area of operations; specifically, the hygiene systems provide a like-home environment that increases morale more than you will ever know…. Once again, thank you (from) all of us for ensuring our warfighters have the best equipment and for providing a piece of garrison while we are deployed."

That's just the kind of response that Hope likes to hear.

"Force Provider: It's all about providing that slice of home to those troops," Hope said. "That's exactly what Gen. Sullivan's vision was, and that's exactly what it's doing today." ❖

A new shower-water reuse system, such as this one shown at the Systems Integration Laboratory at Fort Devens, can capture and reuse 75 percent of gray water, saving millions of gallons of water each year.

David Kamm

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Sky's the limit for airdrops

Story by Bob Reinert

Photos courtesy of the PM-FSS Cargo Airdrop JPADS Team

SOLUTIONS to problems don't usually fall from the sky.

Exceptions to this rule come in the form of good ideas generated by the airdrop professionals at Natick Soldier Systems Center in Massachusetts, whose best answers to tough questions normally float gently to earth. With Soldiers fighting in remote areas of Afghanistan where resupply often must come from the air, that won't change anytime soon.

"If you're going by helicopter to resupply, it's very easy for the enemy to try and shoot you down," said Andrew

In 2010, the Air Force alone airdropped 60.4 million pounds of supplies in Afghanistan, up from 2 million pounds in 2005.

A C-17 Globemaster aircraft drops a Joint Precision Airdrop System over Yuma Proving Ground, Ariz. (Bottom left) A Soldier retrieves a JPADS airborne guidance unit after a drop.

Meloni of Airdrop Technology Team. "So the only means of resupply for some of these bases is airdrop."

In 2010, the Air Force alone airdropped 60.4 million pounds of supplies in Afghanistan, up from 2 million pounds in 2005. "In theater right now, they've been doubling airdrops every year," said Rich Benney, division leader, Aerial Delivery Equipment and Systems Division.

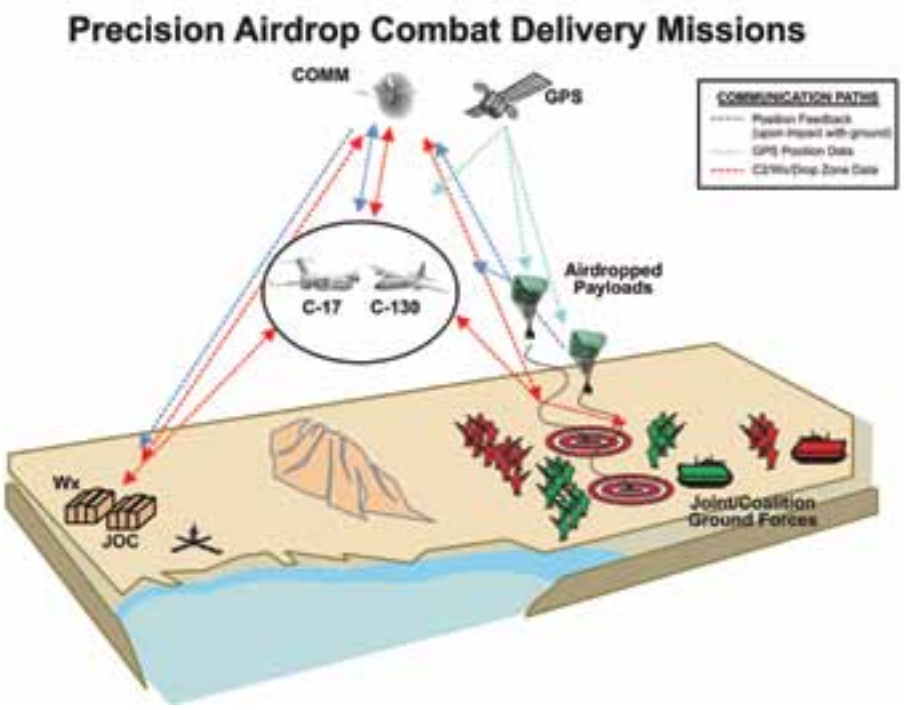
Terrain and wind present further challenges, however. Supplies dropped by conventional means can drift off course or roll down mountainsides and out of safe reach. And when isolated Soldiers don't receive their supplies, lives can be at risk.

"For that kind of high-priority situation, we've developed what we'll call smart airdrop or precision airdrop, which is guided the entire way down," said Chris Ormonde of ATT.

The Joint Precision Airdrop System uses a GPS, avionics and motors to guide steerable parachutes to one or more landing zones simultaneously with the kind of precision made necessary by the rugged terrain of Afghanistan. Though it has accounted for less than 1 percent of all airdrops, JPADS has proved invaluable since its debut there in August 2006. The number of precision deliveries coming down will only increase.

"Right now, there are more than a hundred JPADS 2K systems in theater," Benney said. "It takes a while to get these back after a drop. You're clearly not using a lot of them. Most drop zones can utilize fielded one-time-use, unguided parachute systems. But the JPADS can get supplies into really tight and challenging terrain areas."

"We just basically program in the



A JPADS 2K drifts toward earth above Yuma Proving Ground, Ariz.

landing coordinate—latitude, longitude and elevation—throw it out, and the system will steer itself, completely autonomously, to the target," Meloni said.

That puts Soldiers at less risk when retrieving supplies. The airdrops, made from high altitudes, also keep aircrews safer than they would be on low-altitude passes.

"It gets the Air Force up high, out of the threat range," Benney said. "It allows them to be offset from the target. It allows the Air Force…to either pick from within a big area (launch-acceptability region) in the sky to drop to one point, or they can actually drop from one point and hit multiple targets, which is unique.

"The first time they employed the program of record (which is managed and executed by U.S. Army Product Manager Force Sustainment Systems, also at Natick) in theater…they put out eight bundles…and they programmed four to one (forward operating base) on one side of the valley and four to one FOB on the other side of the valley. That's unique."

Low-altitude airdrops in some areas are perilous.

"Around some regions of Afghanistan, if we come in low, they'll actually shoot from the top of the mountains down on the aircraft," Meloni said. "So getting up high—and by high I mean 17,000 to 25,000 feet—and dropping keeps them out of that threat range from small-arms fire and man-portable air defenses."

The JPADS family of systems allows for the delivery of different payload weights from 10 pounds to tens of thousands of pounds. In a single pass, one aircraft can deliver supplies to multiple FOBs. "We're getting within 100 meters in theater, and we've actually had efforts to push that in closer, within 50 meters," said Meloni of JPADS' accuracy. "It can be dropped day, night—it doesn't matter."

"The accuracies are a function of JPADS weight class," Benney said. "So the smaller it is, the more accurate it is."

The decision of whether to use the accurate but more costly delivery systems depends on the situation. "There is still a subset of drop zones in theater where we do need that really precise, guided system," Meloni said. "As you can see with the terrain there, it's not always easy to get some of this stuff back, so there's been a big push to reduce the cost."

One way to do that, said Meloni, is to use a modular version from which electronics can be removed after the supplies land. "You actually reduce the cost of the system (significantly), and you're able to recover the most-expensive pieces," Meloni said.

Benney said that a normal airborne guidance unit weighs about 90 pounds. PM-FSS has developed a modular AGU that weighs 30 pounds less than that. "The modular AGU repackages existing components and consolidates more than 50 percent of the AGU value in an easily removable module that can be recovered on a hot drop zone and is half the size of a shoebox," Benney said. "Throw it on your backpack (and) leave everything else, if required."

That's not the only opportunity for savings, Meloni said.

"In addition to the lower-cost guidance unit, (PM-FSS has) actually (developed and used a one-time-use, much) lower-cost parafoil," Meloni added.

Meloni called JPADS part of a

"toolbox of systems that the Air Force and the Army can use to get supplies to the troops in Afghanistan or Iraq."

As Benney noted, the Army and Air Force have worked together to field the system. "In general, the Air Force is responsible for getting you to the right point in the sky and knowing the weather," said Benney, "and the Army develops and pays for nearly everything that leaves the aircraft."

In the future, combat teams are likely to find themselves increasingly dispersed around the battlefield in the early days of a conflict. That dynamic environment would make JPADS even more vital to successful resupply and would push further refinements to the system.

On so-called "combo drops," different systems would communicate with one another during a drop. "Right now, they do not know where each other is in the sky," Benney said. "We're looking in the future for secure (communications)…so that each system can say, hey, this is where I am, and this is where I'm going, so that they don't hit each other and can pass each other information that will enhance situational awareness and accuracy.

"You could do—and we're looking at—follow the leader, have them fall into a pattern (stack up), which is what some of the (Special Forces) guys want to do."

The airdrop folks also have been dropping lighter-weight JPADS off of unmanned aircraft, which could be the future of aerial delivery.

"It could be an unmanned aircraft that comes by with all these different things," said Benney, "a loitering aircraft in a battle so you can get somebody anything they want right where and when they want it, very quickly."

Benney knows what airdrop customers are after in the long run.

"They want street corner and rooftop accuracy," Benney said. "Ultimately, we want to be able to go down Third Avenue, take a left on A Street and land right in front of the door." ❖

Cargo guided by JPADS comes to rest in close proximity after an airdrop in Afghanistan. (Right) A JPADS 2K is packed and ready to go.

The ultimate *kitchen remodel*

Story by Bob Reinert

ANYONE who has ever tackled a kitchen remodel knows that it can be a daunting project. Try doing it more than a thousand times.

Talk about kitchen nightmares.

John Oswald has been through the process that often. And the renovations he arranges involve more than simple updates.

As RESET Field Feeding/Field Services Team leader with the Integrated Logistics Support Center at Natick Soldier Systems Center, Oswald has overseen the refurbishment of 1,375 Mobile Kitchen Trailers, 104 Containerized Kitchens and 99 Laundry Advanced Design Systems returning from Iraq and Afghanistan since 2004.

"This was an opportunity, because of the wars, that we were able to fix equipment to almost brand new," Oswald said. "It's not brand new, but it's pretty close."

According to Oswald, prior to 2004, field kitchens didn't go through reset.

"Kitchens (were) not high enough in the Army's priority to repair," Oswald said. "They're going to fix the tanks and the airplanes and all that."

Because the MKTs have not been produced since 1995, plenty needed updating and repair. With no new model planned, MKTs could remain in the field for another quarter-century.

"If the Army had to buy MKTs new, you'd buy them for $105,000," said Oswald, adding that one unit can be reset for only $44,000.

Reset saves even more money with other items: The LADS costs $701,000 new, $188,000 to reset, and the CK is $235,000 new, reset for $128,000.

Of course, the RESET team can't salvage everything.

"Many of these (items) return from (Southwest Asia), (and we) can't even fix them," Oswald said. "They're bent, broken. They are used for parts."

The RESET Field Feeding/Services Team of the Integrated Logistics Support Center gets field kitchens back up and running. (Photo by David Kamm)

Equipment such as this Mobile Kitchen Trailer sometimes come back from the field battered, but the RESET Field Feeding/Field Services Team saves the Army millions by repairing them whenever possible rather than buying new units. (Photo courtesy of RESET Field Feeding/Field Services)

A Mobile Kitchen Trailer is ready to return to service after reset. The RESET Field Feeding/Field Services Team has reset 1,375 Mobile Kitchen Trailers since 2004, saving the Army millions of dollars. (Photo courtesy of RESET Field Feeding/Field Services)

Still, the RESET Team has saved the Army millions of dollars over the past seven years. Even more important, its members have reacted quickly at times to improve the lives of Soldiers in theater.

"They go over and either they don't have the equipment or they don't take it with them because they're going to fall in on some other unit's equipment," said Oswald of deploying units. "They fall in on something that's been over there for a long time. It doesn't work.

"We try to send them, A, parts, or, B, substitute new for old, if we can do it. We get calls probably every week from overseas."

Last year, when Oswald helped get 58 Modern Burner Units, 150 MBU tool kits and 10 food sanitation centers shipped to Afghanistan within a week of a request, a food service officer responded: "It's Christmas in July—thank you very much." ❖

Courtesy of DOD Combat Feeding

As part of the "First Strike Ration," the shelf-stable pocket sandwich gives Soldiers a portable ration that they can eat on the go. The sandwiches always score well in field-testing.

COMBAT FEEDING delivers for Soldiers

Story by Bob Reinert

WHEN Soldiers open up pocket sandwiches in Afghanistan, they probably care a lot less about how they were developed than how they taste and whether they curb hunger.

That's fine with the people at the Department of Defense Combat Feeding Directorate at Natick Soldier Systems Center in Massachusetts, which develops rations for all the services. They're much more interested in giving those Soldiers the fuel they need to accomplish the mission than in getting credit for the sandwiches. But they would tell them that other Soldiers were heavily involved in the process.

"We go out in the field on an annual basis with prototype food items and with existing ration items to make sure that what we're producing is what Soldiers are looking for," said Evan Bick of DOD CFD outreach and education. "We are constantly working on ways to incorporate that warfighter feedback and bring it into our product-development process."

The pocket sandwiches, which can be eaten without preparation either individually or as part of a meal, are known for their ability to last and stay flavorful. These clearly aren't your father's combat rations. State-of-the-art science and packaging have made them more appealing and nutritious for today's Soldier.

"(Soldiers have) been asking for sandwiches for a long time," said Julie Smith, senior food technologist with the Combat Rations Team. "Trying to come up with that technology to be able to provide the sandwich to the warfighter is the difficult part."

The CFD, which originated in the 1920s as the Quartermaster Subsistence School, has overseen major changes in individual rations since the days of beef, beans, rice and bread during the American Revolution. One of the biggest changes is increased input from warfighters.

By the time a ration reaches a Soldier in the field, his or her peers have provided plenty of input about CFD products, including the "shelf-stable" pocket sandwiches. They were developed at Natick as part of the "First Strike Ration," a day's worth of food for highly mobile troops that weighs 50 percent less than three "Meals, Ready to Eat." Five different pocket sandwich varieties are already available.

"We're trying to move with the trends of the commercial industry," Smith said. "So we're always looking for new varieties. Nutrition is a key part. The sandwiches are planned into the menu, and we have to meet the nutrition standards for operational rations."

Soldiers had wanted sandwiches for a long time. Their input helped DOD Combat Feeding make the pocket sandwich a great success story. (Photo courtesy of DOD Combat Feeding)

That requires a lot of hard work behind the scenes. First, food scientists turn ration concepts into products. Next, a food item must be effectively packaged before becoming part of a ration. The sandwiches, like all food items, are then tested in the lab and field-tested by Soldiers.

"With every project that we do, we always try to get as much Soldier input as we can," said Bob Trottier, Combat Rations Team leader. "The feedback we have gotten is that those sandwiches, in particular, are good. Whenever we go out and do demonstrations and samplings of those sandwiches, it's always positive acceptance, because they're really good quality."

After rations pass muster with Soldiers, they go back to the lab for further testing, nutritional analysis, approval and fielding. Obviously, the process is time consuming. "When we say warfighter recommended, warfighter tested, warfighter approved, we mean it," said Gerry Darsch, CFD director. "We're responsible for fueling the DOD's most important weapon, and we take that very seriously.

"When you invite several million people to breakfast, lunch and dinner, three times a day…it's going to be tough. Think about having just your immediate family over for dinner or for a holiday. Are you going to please everybody sitting around that table equally?"

The pocket sandwich was based on a commercially available, microwavable pocket sandwich and became the centerpiece of the First Strike Ration, which must be able to withstand at least 80 degrees Fahrenheit for two years or 100 degrees for six months. Currently, there are three FSR menus centered around the various pocket sandwiches with six more expected this year.

"The FSR is approved for consumption up to 10 days," said Smith, "whereas the MREs…can be consumed for up to 21 days with no nutritional deficit."

The early pocket sandwiches tended to be tomato-based. According to Smith, the acidity helped extend their shelf life. "Now, as time goes on, you're starting to see the change in what people prefer," Smith said. "Now we're moving to something that's not tomato based."

By design, the sandwiches each provide only about 300 to 500 of the 2,900 calories in the FSR. "We try to plan it so they have a lot of components, rather than one item providing most of the energy," Smith said. "If they're walking around, they're not going to eat 800 calories during one patrol."

The pocket sandwiches use what is called "hurdle technology," techniques or stress factors that inhibit the growth of microorganisms and promote stability. "It is this control of the microorganisms that preserves and stabilizes the rations," said Lauren Oleksyk of the CFD Food Processing, Engineering and Technology Team. "The hurdles we use may include a combination of ingredients that control a food's pH, water activity or moisture content; the addition of anti-microbial compounds; the addition of oxygen scavengers to control headspace gas in the package; or even the package itself."

But as Oleksyk knows, flavor can't take a backseat to shelf stability. "If it doesn't pass our quality sensory test's flavor and texture acceptance, it will not be included in any ration platform," she said. "The addition of the hurdles also gives us more leeway to adjust the other ingredients in the sandwich to improve flavor and texture."

That familiar, flexible packaging used for MREs aids that stability. Without it, the pocket sandwich wouldn't be edible for long. "We're protecting against oxygen, moisture and light," said Peter Sherman of the Packaging Integration Team. "It's a level of protection. If the food was sitting here on the table on a plate, it's only going to be good until the microbes start working."

Joanna Graham, team leader for the Packaging Integration Team, said she thinks that the general public sometimes underestimates packaging. "The goal is to supply safe, nutritious food to the warfighter, but so much of what is now available in the field is made possible because of the flexible packaging," Graham said. "The historical transition from cans to flexible packaging changed the way our Soldiers eat and the food products that we are now able to supply, such as shelf-stable pocket sandwiches.

"Packaging is one of those things that is critical to getting the food from point A to point B."

Trottier said CFD is always looking for new pocket sandwich flavors and types. "There's also some new breakfast ones potentially coming down the road, as well, which we will be looking at," he added.

Dr. Scott Montain works for an organization at Natick that doesn't develop food—the U.S. Army Research Institute of Environmental Medicine—but he and his colleagues at USARIEM had critical input into the success of the pocket sandwich. They researched what should go into the sandwich and evaluated what Soldiers thought about the finished product.

"Our role was really…what would you put in a pocket sandwich…in terms of macro nutrients and micro nutrients?" said Montain, a research physiologist. "Do people like it? What flavors do they like? Is the size right? Is the weight right?"

Then it was a matter of measuring how the ration affected performance. "We've played a role in seeing if the (FSR) itself produces the performance effects that one would have anticipated it would," Montain said. "There was a requirement to show that it performed better than the MRE. We led a set of studies for Combat Feeding, where we did those type of tests."

They had wildland firefighters test the FSR. "They're not that different from infantry Soldiers in the sense that they do long days of physical activity," Montain said. "They would work about a half-hour more a day and rest about a half-hour less a day on a given work shift if they were consuming the First Strike Ration (rather) than the MRE. They self-selected to do more work."

The portability of the rations made snacking convenient and kept energy levels high throughout a long workday. "If you feel like you need something to eat, you can get it pretty easily," Montain said. "All the components are ready to eat, making it easier to keep up with your caloric needs as you go."

Each pocket sandwich contains 300 to 500 of the 2,900 calories in the First Strike Ration. (Photo by David Kamm)

According to Montain, the ration's success revolved around the pocket sandwich. "The sandwich is the main component," Montain said. "The ability to start making sandwiches like this has probably led to the success, I would say, of the whole First Strike Ration concept. The pocket gives (Soldiers) the sense of, this is real food. It's not just snacking."

Expect pocket sandwiches with Mexican, Asian and vegetarian ingredients in the near future. What else is on the horizon? Well, nothing says home quite like an old-fashioned peanut-butter-and-jelly sandwich. Smith wants to give Soldiers exactly that, but it's a lot tougher than you might think. Over time, the bread would absorb moisture from the jelly and fat from the peanut butter.

"It doesn't make a high-quality sandwich," Smith said. "We're still working on that. Who wants a soggy sandwich?" As Smith pointed out, Soldiers now can get peanut butter and jelly in separate pouches. "But then they have to make it," Smith said. "They like that eat-on-the-move capability."

No matter what they produce next, the CFD professionals always have one goal in mind. "Basically, it all comes down to how we can support warfighters who are going to be operating in environments that are unpredictable," said Bick, "environments that are going to be very austere, and still provide them some little bit of comfort during that day." ❖

'Ironman'
A game-changer on the battlefield

Story by Bob Reinert

IT all began during an intense 2 1/2-hour firefight with the enemy earlier this year in Afghanistan.

As members of the 1st Battalion, 133rd Infantry Regiment, 2nd Brigade Combat Team, 34th Infantry Division, Iowa National Guard, sat around later at Forward Operating Base Mehtar Lam and discussed the engagement, they talked about how three-man teams manning crew-served weapons struggled to stay together over difficult terrain in fluid battles.

Someone mentioned actor Jesse Ventura in the movie "Predator." His character brandished an M-134 Mini-gun fed by an ammo box on his back. After the Soldiers had a good laugh over that thought, Staff Sgt. Vincent Winkowski asked why a gunner couldn't carry a combat load of ammo. He decided to pursue the idea.

"When we first arrived in theater in late October (2010), we were issued the Mk 48 7.62 mm machine guns," Winkowski said. "This was a new piece of equipment for us, and we struggled to come up with a solution for carrying and employing ammunition for it due to our small size and the inability to have a designated ammo bearer, as is common doctrine with the M240B.

"The ammunition sacks that came with it made it too cumbersome and heavy to carry over long, dismounted patrols and especially when climbing mountains. Initially, we came up with using 50-round belts and just reloading constantly, which led to lulls of fire and inefficiency."

So Winkowski grabbed an old ALICE (all-purpose lightweight individual carrying equipment) frame, welded two ammunition cans together—one atop the other after cutting the bottom out of the top can—and strapped the fused cans to

David Kamm

The "Ironman" ammo-carriage system resulted from the innovative thinking of Iowa National Guardsmen serving in Afghanistan. (Photo courtesy of 1st Battalion, 133rd Infantry Regiment, Iowa National Guard)

the frame. To that he added a MOLLE (modular, lightweight load-carrying equipment) pouch to carry other equipment.

"We wondered why there wasn't some type of dismounted (Common Remote Operating Weapons Station) that fed our machine guns instead of a mini-gun as portrayed in the movie," Winkowski said. "So, I decided to try it using the feed chute assembly off of the vehicle CROWS. We glued a piece of wood from an ammo crate inside the ammo cans to create the decreased space necessary so the rounds would not fall in on each other.

"My Mk 48 gunners, Spc. Derick Morgan and Spc. Aaron McNew, who also had input to the design and evaluation, took it to the range and tested it, and even with its initial shortcomings, it was much better than the current TTP (tactics, techniques and procedures) we employed. On Feb. 26, 2011, our prototype 'Ironman' pack even saw its first combat use by Spc. McNew when our squad was ambushed by up to 50 fighters in a river valley, and it worked great!"

After attaching pictures of the prototype to a request for information, Winkowski gave it to forward-deployed science advisers from the U.S. Army Research, Development and Engineering Command.

The request landed on the desk of Dave Roy, a current operations analyst in the Quick Reaction Cell of the Natick Soldier Research, Development and Engineering Center Military Deputy's Office. "We looked at it," Roy recalled. "My first reaction was, 'Wow, that's cool.' I thought it was great."

In his 21 years as a Soldier, he had seen his share of ingenious solutions to problems. "Our doctrine encourages Soldiers to think for themselves," Roy said. "That's why we're so effective on the battlefield. One of the things that makes us so effective against our opponents throughout history is the fact that we recognize the value of the doctrine, but we are not slaves to it."

Roy knew that there was no time to waste, because Soldiers on the ground needed a solution as quickly as NSRDEC could get it to them. He consulted with Natick experts in prototypes, load carriage, machining and fabrication. Forty-eight days after the request was received, and after inspecting and measuring the Soldier's original, QRC had a prototype of the "High-Capacity Ammunition Carriage System" back in theater.

"I've dubbed it the 'Ironman,' because the unit in the field that developed the initial design is from the Iowa National Guard," said Roy, "and they

The Ironman system uses a MOLLE medium frame designed to carry up to 60 pounds. In addition to the cargo area for ammunition, Soldiers can carry at least two pouches for mission-essential gear. (Photo by David Kamm)

In the Ironman ammunition-carriage system, rounds move through a 27-inch-long feed chute designed for the Common Remote Operating Weapons Station (CROWS). NSRDEC hopes to find a simpler, lower-cost solution in the future. (Photo by David Kamm)

are considered Task Force Ironman."

The folks at NSRDEC substituted a MOLLE medium frame for the ALICE frame. The ammo compartment now uses polycarbonate plastic instead of the original tin. Until NSRDEC can come up with a simpler, more cost-effective substitute, the ammo will continue to move through a 27-inch-long, $1,710 feed chute designed for the CROWS, which the Guardsmen had employed.

"I knew in order for this to work, it needed to be as modular as possible," Roy said. "It needed to be based off of a current technology. We were able to put everything together very quickly … and were able to prove that with a combat load—that's 43 pounds with 500 rounds, inclusive of the weight of the kit itself—that still gives the Soldier 17 pounds worth of cargo weight to attach to the frame and still be within the design specifications for the MOLLE medium."

"We pretty much took their design and just reverse-engineered it and improved upon it," said Laura Winters, who headed up the fabrication effort. "Considering where we started from and what we got to, I think it worked very well. It was a very good collaborative effort. Everybody knew there was (an) end goal."

As Roy pointed out, technology isn't always about the whiz-bang stuff. "Sometimes," he added, "it's merely a simple application of existing technologies in a different format that provides an elegant way to fill a capability gap."

Word has circulated rapidly in theater about the Ironman prototype.

"We've already gotten email traffic from (one of) our science advisers that everybody in theater wants one of these—and by in theater, he means his specific area of operation, Regional Command East in Afghanistan—because word has spread," Roy said. "That (Iowa National Guard) unit is not the only unit on that FOB. As they're walking around the FOB with that piece of kit, very senior people are taking a look at it. They recognize it as a game-changer.

"It's gotten quite a bit of high-profile visibility and positive feedback … that this is a good idea. I believe we've been able to meet the objectives laid out by that unit."

Roy is the first to admit that producing prototypes is one thing; getting the Ironman into the formal acquisition process is another. Still, he hopes that can be accomplished by early in fiscal year 2012.

"Like James Bond and Q," said Roy, "Q can come up with a one-off design for an explosive ballpoint pen. If that material solution fills a gap, you don't just want to have one of them, or you don't want to just have the designs on a cocktail napkin. You want to have something to fill that capability gap very quickly."

During this accelerated development process, Roy saw how the Ironman could increase a small unit's effectiveness in combat.

"To allow the gunner himself to be able to have this kind of firepower increases his lethality," Roy said. "By increasing his lethality, you've also increased his survivability by a certain amount.

"Now that gunner has 500 rounds of ammunition. It's very difficult for me to make him ineffective."

In addition to the prototype in theater, NSRDEC had several more Ironmen on hand. "We've gotten some initial feedback from the Soldier and from his gunner on how to make some design changes," said Roy, "and we've incorporated the majority of those design changes—minor stuff, but it's always…the minor stuff that makes any kind of system more efficient and more user-friendly."

Roy said that more technological advances are in the pipeline at Natick.

"I'm confident that we have projects in place that will prove that the Ironman is the rule rather than the exception," Roy said. "We can provide you strength through technology, and we can do that in a rapid manner. We are, in fact, a force multiplier.

"There (are) an awful lot of great ideas on the drawing board right now that are of value to Soldiers in the fight today." ❖

The Ironman system allows a gunner to carry 500 rounds of ammunition weighing a manageable 43 pounds on a MOLLE frame. (Photo by David Kamm)

The Ironman can hold 500 rounds of ammunition for a crew-served weapon. (Photo by David Kamm)

Walter Reed moves to Bethesda

AFTER more than a century of providing comprehensive health care to active and retired servicemembers and their families, the Walter Reed Army Medical Center in Washington has officially closed its doors.

The largest of the Department of Defense's medical centers, Walter Reed had been at the forefront of medical instruction, clinical research and patient treatment, and had grown to care for some 775,000 outpatients annually.

"I spent some of my proudest, most challenging and humbling moments, both personally and professionally, in the arms of Walter Reed Army Medical Center," said Army Surgeon General Lt. Gen. Eric B. Schoomaker during a ceremony, July 27. He reminisced about his early career as a young clinician at the Walter Reed campus. "I stand before you with a heart burdened with sorrow, yet swelling with pride as we witness the colors of this command for the final time."

As part of the 2005 Base Realignment and Closure announcement and a move to make medical facilities joint-service, the DOD proposed that Walter Reed be combined with the National Naval Medical Center on its grounds at Bethesda, Md. The new medical complex there will be known as the Walter Reed National Military Medical Center.

Secretary of the Army John McHugh addresses an audience of more than 1,000 who turned out to witness the casing of the colors at Walter Reed Army Medical Center in Washington, D.C., July 27. (Photo by J.D. Leipold)

"I have full faith and trust that the Walter Reed National Military Medical Center at Bethesda will embody the same transcendent kind of loving care and healing and will proudly build upon the Walter Reed legacy," Schoomaker said.

Patients at Walter Reed Army Medical Center were transferred in August to either the Bethesda facility or the new Army hospital at Fort Belvoir, Va.

The Walter Reed General Hospital first opened its doors May 1, 1909. The facility was named after Maj. Walter Reed, the Army doctor who led the team credited with discovering that yellow fever was transmitted by mosquitoes.

As the Army vacates the old Walter Reed grounds, the 113 acres there will be split between the Department of State and the District of Columbia reuse commission. ❖

— J.D. Leipold/ARNEWS

Chaplain Corps growing

THE Army's Chaplain Corps has a new chief, peak numbers and unprecedented diversity.

Major Gen. Donald P. Rutherford, a Roman Catholic priest, is now at the helm of more than 2,900 chaplains from 130 different faith groups, including about 1,200 chaplains in the Army Reserve and National Guard.

Recently, the Army signed up its first Hindu chaplain and now has two Buddhist chaplains. Since 2001, six Muslim chaplains have joined the force. There are also six Eastern Orthodox chaplains and 10 Jewish chaplains on active duty. In addition, 66 female and 147 African-American chaplains minister to Soldiers.

"As our country and our Army has become more diverse, so has the Chaplain Corps," said Lt. Col. Carleton Birch, strategic communications director for the chief of chaplains.

Since the start of the war on terror, Birch said, the Chaplain Corps has grown significantly in force structure.

"After 9/11, leadership from all over the Army realized the importance that chaplains play," Birch said.

The Chaplain Corps has also seen an influx of recruits since that time, and Birch said there has specifically been an increase in prior-service chaplain candidates.

"Many get serious about their faith while they're on active duty," Birch said. They return from a deployment, he explained, with a call to the ministry.

Six years ago, the reserve components of the Army were short 600 chaplains, according to Birch. That gap has since closed by half, and he said the Chaplain Corps is on track to be filled up by 2014, despite a continuing shortage of Catholic chaplains. ❖

— Gary Sheftick/ARNEWS

Army to implement 63 acquisition recommendations

THE Army will implement 63 recommendations put forth in the final report of the "Decker-Wagner" acquisition review.

The report, "Army Strong: Equipped, Trained and Ready," is the result of a review chartered by Secretary of the Army John McHugh to look into the Army's acquisition processes. Gilbert Decker, a former Army acquisition chief, and retired Gen. Lou Wagner, former chief of the Army Materiel Command, chaired the panel that produced the report.

One of the recommendations is to put limitations on the number of key performance parameters and key system attributes, or KSAs, in a program. These have a significant impact on cost and schedule, officials said.

Another recommendation is to give industry the flexibility to provide the government cost-effective and timely designs by making KSAs "tradable." For instance, industry might be able to produce a product more quickly or at less cost if the Army were willing to accept a design that didn't meet all of its requirements. ❖

— C. Todd Lopez/ARNEWS

Army looking at JLTV production

AFTER refining requirements during a two-year technology development phase for the Joint Light Tactical Vehicle, Army developers said they are poised to conduct a full and open competition geared toward formal production.

The Joint Light Tactical Vehicle, or JLTV, will be a next-generation light vehicle designed to bring Soldiers an unprecedented blend of protection, payload and performance, said Tim Goddette, director of Sustainment Systems.

The technology development, or TD phase of JLTV development, completed in May, successfully demonstrated the vehicle's ability to meet a wide range of requirements, including protection against improvised explosive devices, Goddette said. The JLTV also demonstrated off-road mobility, exportable power and essential command, control, communications, computers, intelligence, surveillance and reconnaissance, or C4ISR, capabilities, he said.

The 27-month phase included prototype vehicles from three teams of vendors: BAE-Navistar, Lockheed-BAE and General Tactical Vehicles (General Dynamics and AM General).

Due to its enhanced technological capabilities, the JLTV will be able to perform a wide range of missions and perform many roles Humvees are currently unable to do, Goddette said. At the same time, the Army has embarked upon a competitive Humvee recap program aimed at improving the survivability of the existing vehicle already in the Army inventory.

There are two categories of JLTV:

The Combat Tactical Vehicle is a four-person, general-purpose vehicle with a curb weight of 13,000 pounds and the ability to carry 3,500 pounds of payload and 3,500 pounds of add-on armor.

The Combat Support Vehicle is a two-passenger utility vehicle with a short cab/open bed for hauling equipment or putting on shelters. ❖

— Kris Osborn/ASA(ALT) Public Affairs

The Army tests a new vehicle that could serve as a replacement for the iconic Humvee on a dirt test track about 30 minutes from Aberdeen Proving Ground, Md. (Photo courtesy of RDECOM)

Deployments to be cut to nine months

BEGINNING Jan. 1, most Soldiers will deploy for only nine months, meaning more time at home with their families.

"Implementation of this change is based on the projected demand for Army forces, and remains contingent on global security conditions and combatant commanders' requirements," said Lt. Col. Peggy Kageleiry, an Army spokesperson.

Corps headquarters and individual augmentee deployments—especially those with low-density skill sets—will remain at 12 months, she said.

This change in policy, to be fully implemented by April 1, will affect Soldiers in all named operations, including Operation Enduring Freedom in Afghanistan, Operation Noble Guardian in Kosovo, and Multi-National Forces Sinai in Egypt.

Reserve and National Guard unit deployments will be the same as active duty—nine months, even though they may still be mobilized for 12 or more months.

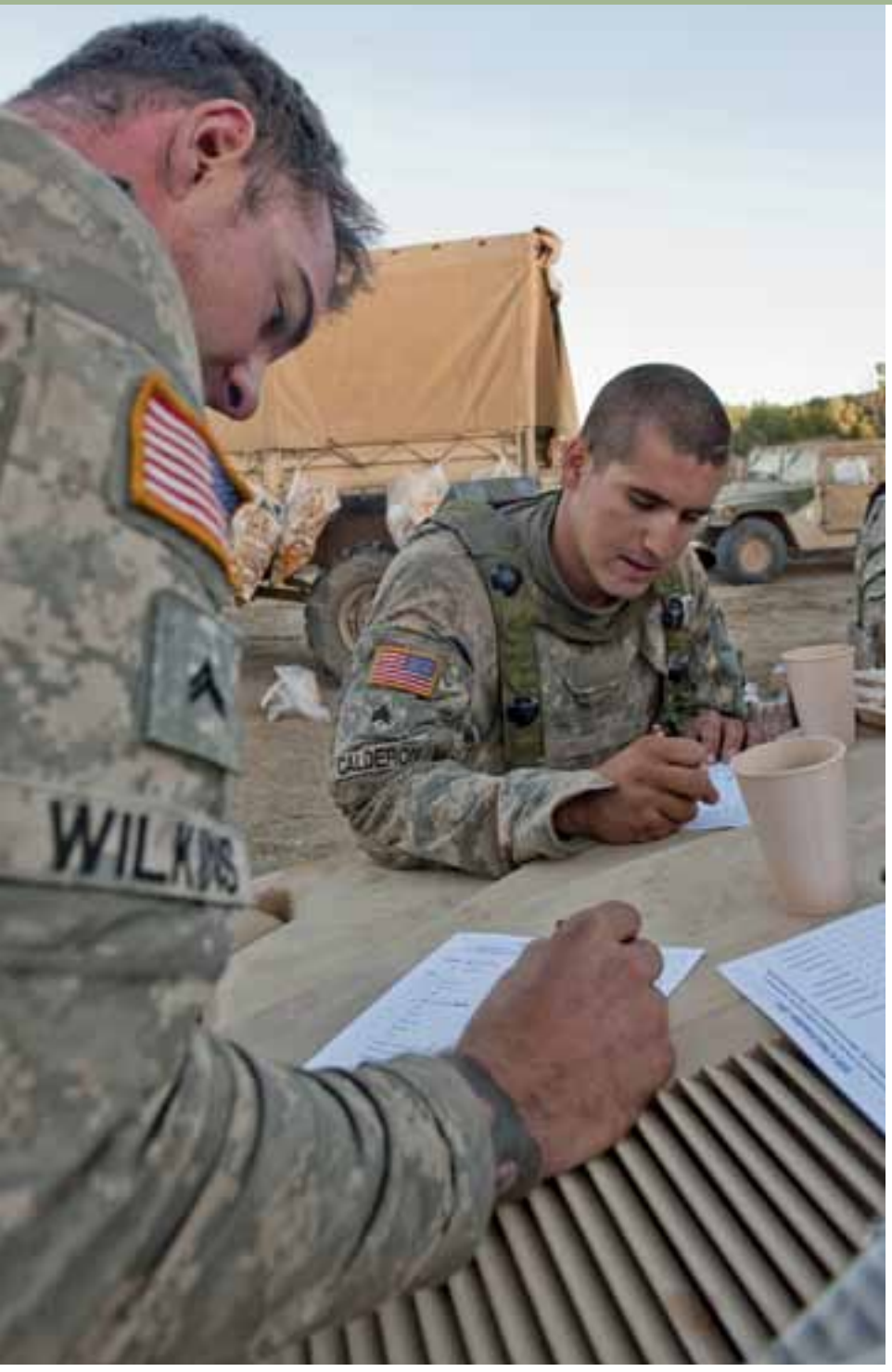
Soldiers deploying under the change in policy will not be granted environmental morale leave, known as R&R, but commanders will retain the option of granting emergency leave and leave for special circumstances, according to Army regulations and local policy.

"This policy will enhance operational success by reducing the friction that comes with having 10 percent of a commander's personnel being away on leave in the middle of a deployment," Kageleiry said. ❖

— Rob McIlvaine/ARNEWS

FEEDBACK

Listening to Soldiers



Nothing is valued more highly at Natick Soldier Systems Center than Soldier feedback.

Story by Bob Reinert
Photos by David Kamm

SOLDIERS should always have their say.

At least, that's the unwavering opinion of two groups of people at Natick Soldier Systems Center in Massachusetts—the Operational Forces Interface Group and the Consumer Research Team—who spend considerable time collecting Soldier feedback on everything developed there.

The organizations send representatives to the field to ask Soldiers about their experiences with Natick products. Max Biela, OFIG team leader since 2003, looks for them immediately after deployments or major training exercises whenever possible.

"Ideally, you want to catch them as soon as they get back, because any problems they had with equipment (are) fresh," Biela said. "If you delay too long, they may not remember they had an issue with it until the next time they put it on. The fresher we can get the data with the issues, the more the Soldier will write about those items."

What makes Soldier input invaluable? "If anybody's going to break, rip, tear or destroy something, it'll be the Soldier doing his normal day-to-day activities," Biela said. "And if it happens, then it's not durable."

Biela wants Soldiers to know that the project engineers and scientists who develop what they use in the field read the questionnaires they fill out closely.

"All the data has to be hand-carried back," Biela said. "A blank survey is just that, a blank survey. Once that Soldier puts his information on there, that's the most valuable piece of paper that we could own, because that's the data that we're looking for.

"I can say that the engineers and the scientists that I work with are dedicated to their jobs, but in order to do their jobs, they need the Soldiers' feedback on how that equipment is working. That data actually goes back to the people who are designing their equipment and used to improve their equipment. Soldiers aren't necessarily stuck with their gear. If there's a problem, and it's raised, it can be fixed and fixed quickly."

Since its origins in 1984 as a two-person, customer-feedback organization, OFIG, now with a staff of 15, has branched out to do command exhibits, technical exhibits and run the Natick Soldier Research, Development and Engineering Command "greening" programs to teach civilian employees more about the Army. Its mission of gathering Soldiers' feedback continues to be a core function.

"You can't get anything improved unless you know what the problems are," Biela said. "You can do all the technical testing in a controlled environment you want. That doesn't mean it's going to work for the Soldier in the field. That's what we need to find out."

"I think our role is really to make sure that their opinions are captured," said Adam DiChiara, a research psychologist with CRT. "Product developers here have a lot of great ideas, but as an organization, we rely on Soldier feedback to know whether something actually works in the field."

When Soldiers speak their minds about equipment, they tend to be direct. The OFIG and CRT staffs prefer that. "I don't think we have any problem with getting an honest answer," DiChiara said. "Nobody's going to just tell us what we want to hear. That's a good thing.

When personnel from Natick Soldier Systems Center go to the field to evaluate food or equipment, they strive to be completely impartial.

"When they give us their feedback, it's usually pretty blunt and it's sometimes pretty detailed, because having used a piece of equipment for 30 days, they can tell you what they don't like about it and how they think it should be."

Of course, Soldiers seldom speak with a unified voice. "Different guys might have different ideas," DiChiara said. "No one's going to agree on everything. And that's our job, to sort of understand those dynamics and translate that back to the people developing it."

In conducting field surveys, OFIG and CRT stay impartial.

"The guys (who) go out, they owe no allegiance to any piece of equipment that they issue," said Biela of his equipment specialists. "We will not give our opinion, even if asked by the Soldiers."

"Our priority is collecting data that accurately reflects the Soldiers' experience with the prototypes, regardless of whether they like them or not," said Zach Given, another CRT research psychologist. "It's really important to us to remain impartial when interacting with the Soldiers. They voice their opinion, and we translate their voice into numbers and report on them."

Those reports can shoot down what seemed like great ideas in the Natick laboratories. "Our job is not to go out to the field with preconceived notions about what will perform well or be most liked," DiChiara said. "I think our job is to be objective and unbiased about it and actually find out, well, what do Soldiers think?"

Given said that having the same Soldier express positive and negative views about a single item "is what makes our team relevant as…a team of psychologists." Given added that the team tries to "represent the total

Dan Harshman, an equipment specialist with the Operational Forces Interface Group at Natick Soldier Systems Center, conducts a field evaluation of the Female Soldier Combat Uniform earlier this year at Joint Force Headquarters, Massachusetts National Guard.

opinion of the Soldier."

DiChiara said that other groups at Natick look at the functional performance of technologies, or how products developed there affect Soldiers physically. "The Consumer Research Team is more concerned with what Soldiers like and dislike, and why," DiChiara said.

OFIG and CRT often work together in the field. "OFIG, they speak the language," DiChiara said. "They know who to talk to. We have a strong relationship with OFIG, and our two groups fill different roles."

OFIG also has developed networks with units and commanders throughout the Army over the years. "A lot of units know us, and quite a few units have contacted us to volunteer," Biela said. "They get to have a say in the newest equipment. They realize that their Soldiers have the opportunity to make a difference in the equipment or rations by providing their input to prototype and developmental equipment/rations or by participating in a down select of multiple commercial-off-the-shelf items.

"Most of the people in the office are ex-military. So we know training schedules. We know who to go to in a unit. You've got to be able to understand military terminology. You've got to know how to talk to Soldiers. It's a different language."

Staff from both groups will do whatever is necessary in the field to get the job done. Justine Federici, another research psychologist with CRT, even helped measure Soldiers when doing work on the proposed Female Soldier Combat Uniform. The FSCUs were issued to 100 National Guard, 100 Reserve and 400 active-duty female Soldiers who participated in the user assessment.

"We all do stuff like that, where we'll cross train…with other people (who) provide support," Federici said. "I'm really interested to see what the

Members of Natick's Consumer Research Team and Operational Forces Interface Group will go anywhere—including Alaska—to get Soldier feedback on products. Here, Zach Given of CRT has Soldiers complete field evaluations on cold-weather rations.

women say with the (FSCU), because I was part of the issue team."

On a trip earlier this year to Joint Force Headquarters, Massachusetts National Guard, Dan Harshman, an OFIG equipment specialist, asked Guardsmen to complete detailed 7-page questionnaires about the FSCU they were issued last year to field-test.

"This is actually the toughest part," Harshman said. "Everybody wants new stuff, but nobody wants to pay the toll for us."

On this particular day, however, the Guardsmen dutifully filled out the questionnaires and voiced a few opinions.

"Men's bodies and women's bodies are different," said Lt. Col. Catherine Corkery, logistics officer and director for human resources, Massachusetts Army National Guard. "I like the pants, because they're a better fit for women. I would probably like them an inch or two longer."

The FSCU coat was a different matter for Corkery. The sleeve cuffs irritated her wrists initially. "But now that I've washed it a few times, it just softened up and it fits much better," Corkery said. "I find (the uniform) to be comfortable. I wish I had it when I was in Iraq because…when I lost… weight, I tried to go to the smaller-size men's pants. It just didn't work, because the butt was too big."

Corkery's opinion differed from that of Staff Sgt. Larain O'Connor, who didn't mind the FSCU coat but disliked the tapered trousers. "I'm not a big fan of it," said O'Connor of the uniform. "That's why I never really wore it after we tried them. It's not very comfortable.

"I like the old uniform, personally. It's just more comfortable, kind of like wearing pajamas."

Though she thought the uniform was comfortable overall, Staff Sgt. Rose Alectine agreed with O'Connor's view of the trousers. "If they fix the pants, it would be good," Alectine said. "It's great that they thought of us women."

"I'd say it's kind of split down the middle," said Harshman of the Guardsmen's feedback on the new uniform. "I guess this will tell us."

As Biela noted, product evaluations are cyclical in nature. When new technologies are applied, OFIG is back soliciting Soldier feedback on the same items they evaluated previously.

"Do all items get adopted?" Biela said. "No, sometimes they go out to Soldiers and none of the items (do). The item currently issued is probably better than some of the ones we've tested, but that's the purpose of testing with Soldiers…to see whether this is going to work."

While collecting data on one item, researchers often get Soldier feedback on other items. "When we're out there with the Soldiers doing a field evaluation, on the back of the survey pages, we always get comments about items that have nothing to do with the current field evaluation," said Larry Lesher, a CRT mathematical statistician, "but we always bring these comments and concerns back here to Natick and let whoever is responsible for that particular item know that this is what we found."

CRT and OFIG have only one goal in mind—helping get the right equipment to Soldiers. "The main priority is to make sure that everything is collected fairly and evenly," said Given, "with no bias in any direction for any of the products."

A Soldier takes a moment to fill out a field evaluation form after eating a meal developed at Natick Soldier Systems Center.

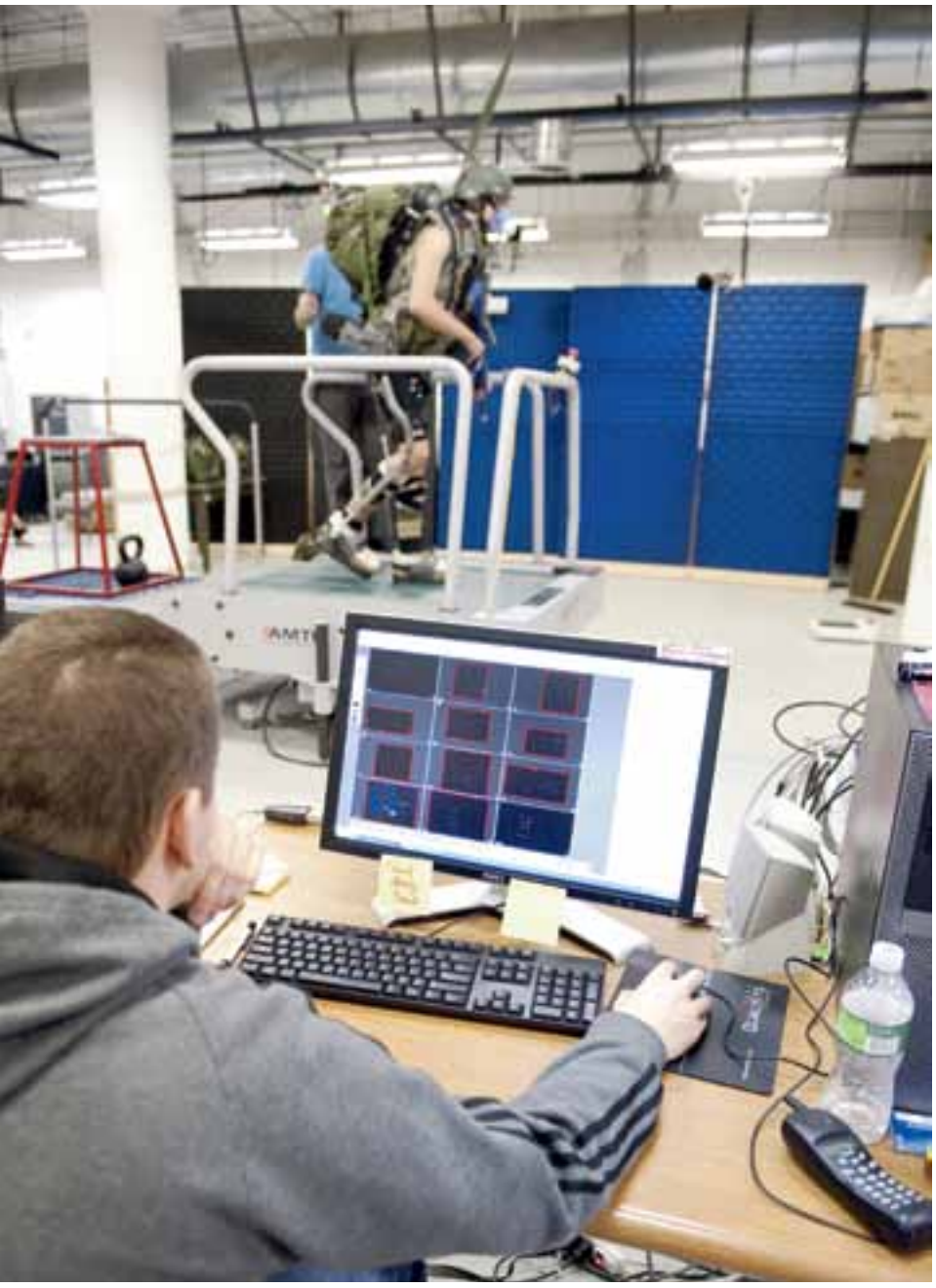
When new products are fielded, these groups often get little or no notice for their roles in the development. Biela doesn't worry about that.

"We don't need bragging rights to do our job," Biela said. "A lot of us are ex-Soldiers. We know there's a job to do, we know it's important, and we do it." ❖

Testing in progress

Soldiers help researchers develop, refine gear for warriors

Story by Bob Reinert Photos by David Kamm



Human research volunteers are closely monitored as they take part in studies and testing at Natick Soldier Systems Center.

IF asked to identify Soldiers doing some of the most important work in the Army, one probably wouldn't immediately think of 30 who reported directly to the Natick Soldier Systems Center in Massachusetts from advanced individual training.

Yet four times a year at Natick, groups this size play major roles in the Army's future. During their 89-day stays there, they sometimes accomplish enough to have significant impacts on their fellow Soldiers for years to come. Not bad for men and women new to the military.

Known as human research volunteers, these Soldiers help researchers conduct medical studies and equipment testing to determine where to spend—or not spend—millions of taxpayer dollars. "They're very, very important," said Col. (Dr.) Keith L. Hiatt, until recently the medical director of the U.S. Army Research Institute of Environmental Medicine at Natick. "There's no sense in buying a million new backpacks that the guys can walk maybe a mile in and their back hurts so much."

Since 1954, more than 4,000 Soldiers have served as HRVs at Natick. They have taken part in medical studies for USARIEM and helped test a variety of equipment in extreme conditions for the Natick Soldier Research, Development and Engineering Center.

"We recruit roughly four times a year, about 30 each, so it's about 120 (Soldiers) a year," Hiatt said. "You don't need 2,000 people to do this. Ideally, you need 20 or 40. And if 20 to 40 people can help the Army buy a mil-

lion widgets or come up with a whole new guidance on how you survive a swamp or whatever, that's…a good investment."

Mary Anne Fawkes has managed the HRV program at Natick for four years and has accompanied Hiatt on those recruiting trips. During her tenure, she has watched young Soldiers make valuable contributions to deployed servicemembers.

"They're the best people to test each of the products," said Fawkes of the HRVs. "This really works well. These brand-new Soldiers, a lot of them come up and give great feedback."

As Fawkes pointed out, the program recruits Soldiers between ages 18 and 39. "They want the wide range," she said. "They want everyone for the studies. That's what the Army is. It's made up of the same people as society."

Timing incoming groups to take over for current HRVs can be a challenge, Fawkes said. "We have to have these people just as the other ones are leaving," she added. "That's why we always keep track of exactly what studies are coming down the pipeline and how we can follow along and make sure that we have enough Soldiers to fulfill the mission."

Not only are their opinions valued, HRVs get plenty out of the program. "They get to meet other people that they may not have otherwise even had a chance to meet," Fawkes said. "These are things that an average Soldier that goes someplace else would never have a chance to do. It's a benefit for both sides."

Specialist Sean Brandt and Pfc. Josh Hernandez—both trained as helicopter mechanics—came to Natick after AIT to try and make a difference for Soldiers.

"For me, it worked out really well on all sorts of different levels," Brandt said. "I got to participate in some things. I got to help the Army develop new stuff, which was cool to me. I (did) something that a lot of people don't get a chance to do."

"As far as the research, you're actually helping," Hernandez said. "That's really cool."

Why are HRVs such as Brandt and Hernandez so important? "To do good research, if it's going to affect humans, you need human volunteers," Hiatt said. "Soldiers, by definition, are going to be a much better population to work with, for the simple reason that…they know what it is to wear this stuff, and they are in good condition, and they know what it is to be a Soldier."

Hiatt said that when he went on recruiting trips throughout the year, he made sure to bring in Soldiers who were physically and mentally prepared to contribute to studies and testing at NSSC. He added that if this small group "can help the Army procure either knowledge or a product, they're helping not only themselves, they're also force multipliers, because they're helping the whole Army. We do some pretty intense things."

Safety always comes first with human research at NSSC, however. "The whole idea is it's got to be as safe as possible," Hiatt added. "They're wired up all the time when they're in really intense environments. We make sure that all risks are mitigated as much as possible and that appropriate medical coverage is going to be available.

"It's almost like the 'Right Stuff' sometimes, they've got so many tubes and lines and things. From a physiologic standpoint, and a medical standpoint, we control everything. If you're putting somebody in 140 degrees on a treadmill with MOPP (mission oriented protective posture gear) 4 on, it's a big deal."

As Hiatt pointed out, USARIEM usually has three doctors, four medics and a physician assistant tending to the HRVs. "We have staff that's completely dedicated only to taking care of them," Hiatt said. "There's no place in the

Every 90 days, 30 Soldiers fresh out of Advanced Individual Training come to Natick Soldier Systems Center in Massachusetts to participate in the Human Research Volunteer Program. Volunteers are recruited from a variety of MOSs.

Researchers monitor a Soldier while he walks on a treadmill in the Doriot Climatic Chambers at Natick Soldier Systems Center.

Army that's got that intensity of medical support for 30 people."

HRVs are given briefings on all of the studies and testing under way at Natick. They might be asked to work out in extreme heat or cold, or at various altitudes. They could be deprived of sleep or food for periods of time. And they could test food, clothing or equipment in varying conditions.

"They volunteer to come up to Natick," Fawkes said. "They can volunteer to leave whenever they want. They can drop out (of a study) whenever they want."

They can select what to participate in, as long as they meet certain criteria. "It's like a Chinese buffet or a smorgasbord," Hiatt said. "You just choose what you want, and they're briefed on absolutely every one of them."

Hernandez and Brandt said they both signed up for every item on the menu.

"I took every single one," Brandt said. "That was really nice, because they schedule it all. There's a schedule every week that tells you exactly where you need to be and what you're going to be doing, which, I think, helps you as a Soldier. You can just focus on doing your PT and doing your studies."

Brandt did one study that looked at how fatigue affects the body. "You do this lift with (a) box that weighed 22 pounds," Brandt said. "The camera would track… movement of your joints. It was really kind of cool to see and be a part of, and it was definitely hard."

Hernandez participated in a study about proposed changes to the Army Physical Fitness Training Program. "It was a little bit more strenuous than I thought it would be," Hernandez said. "They test to see if you're getting any stronger, if you're getting any improvement. I definitely have gotten stronger since I've been here. We don't get any major injuries or anything, but we definitely are sore after that."

The HRVs become accustomed to the constant monitoring during studies and testing. "You kind of realize this is what I'm here to do," Brandt said. "I'm here to test stuff. I'm here to try stuff out. As I've been here a little longer, it's kind of…part of the job."

Natick has taken HRVs from the ranks of helicopter mechanics, supply clerks, tankers, cavalry scouts, infantrymen and artillerymen, among others.

"It's a broad spectrum," Hiatt said. "We prefer not to do just straight combat arms, because there (are) no females. We'd like to get MOSs that have females in them, because…the Army's 20-odd-percent female. It's good to have the mix."

Most have no regrets afterward, Fawkes said. "The majority of them do say that they're really glad they did this and it was really great for them," Fawkes said. "Most people rave about how good it is here."

All of the testing at Natick aims to provide Soldiers with the best technology and gear available in the world. HRVs help researchers stay on target.

"The Army thinks that Soldiers are performance athletes, basically," Hiatt said. "Whatever we give him, it's got to last and it's got to work, and it's got to not malfunction. We also have to provide him the right water and the right food, so that he functions, too, physiologically. That's why we do what we do." ❖

Rising to the challenge of **high-altitude fighting**

Story by Bob Reinert

YOU'RE getting headaches. You're dizzy and nauseous. You haven't been sleeping or eating well.

The fight on the mountainside hasn't even begun yet, and you're already at a significant disadvantage: You probably have altitude sickness, and the more you exert, the sicker you'll get.

When it comes to Soldiers reaching their peak performances, little on today's battlefield stands in the way quite like the imposing mountains of Afghanistan.

The country's vertical terrain and high altitudes pose extreme challenges. Soldiers must carry heavy loads at steep angles that threaten their normal tactical advantages. Simply put, the higher they go, the more difficult everything becomes. Fortunately, scientists at the U.S. Army Research Institute of Environmental Medicine at Natick Soldier Systems Center, Mass., are applying their expertise to the problems.

"One of the main issues with altitude illness is that it varies dramatically between individuals," said Dr. Stephen Muza, Mountain Medicine Group team leader of USARIEM's Thermal and Mountain Medicine Division. "We can take fit Soldiers, they can look almost identical in terms of their typical Army characteristics…yet one may get sick and one may not at 10,000 feet. Why is that? We don't know. There's a lot of work being done to try to understand what is causing this individual susceptibility or risk."

Using USARIEM facilities such as the hypobaric chamber, scientists can study this and other issues by simulating conditions experienced by Soldiers in Afghanistan and elsewhere. The chamber is capable of creating barometric pressures found from sea level to 9,000 meters, temperatures from minus 32 to 43 degrees Celsius, and relative humidity from 20 to 80 percent. Soldiers can be tested for days at a time in the chamber, which includes access to a toilet, shower and running water.

"So we can not only simulate true altitude…but also we can control the temperature and the humidity to reflect real environmental conditions that you find out in the field," Muza said. "It can be cold. It can be hot. It can be humid. It can be dry. We can go up to altitudes of 30,000 feet with our chamber, and that gives us great ability to study rapid responses to a range of altitudes."

Regardless of their levels of physical conditioning, Soldiers can experience increased fatigue or even acute mountain sickness in this environment. USARIEM's chamber allows measurements to be made repeatedly on small groups of volunteers before Soldiers experience symptoms in combat. Researchers study human research volunteers in simulated high-altitude environments to learn more about performance, nutrition and how to avoid mountain sickness.

Studies not appropriate for the

The high altitudes of Afghanistan can have a negative impact on Soldiers' health and performance. The U.S. Army Research Institute of Environmental Medicine at Natick Soldier Systems Center continues to study the issue. (Photo by Sgt. Teddy Wade)

Even the most well-conditioned Soldiers can experience increased fatigue or even acute mountain sickness when fighting at high altitudes. (Photo by Sgt. Edward A. Garibay)

hypobaric chamber can be done in USARIEM's hypoxia room, in its lab atop Colorado's Pike's Peak or in the field. "We do not hesitate to go out into the actual field environment," Muza said. "We carry our equipment with us."

According to Muza, sickness in Soldiers working at high altitudes can be predicted statistically. His studies indicate that at 10,000 feet, 25 to 30 percent will become sick; at 11,500 feet, 50 to 60 percent; at 13,200 feet, 80 to 90 percent and, finally, at 14,800 feet, 90 to 100 percent.

"I should point out that if you go high enough," said Muza, "everybody will get sick, pretty much."

The numbers point to the reason that Muza hopes to one day accurately predict which Soldiers are most likely to become sick at different altitudes.

"We've been working on models that estimate what the likelihood of developing altitude sickness is, and if you do develop the altitude sickness, whether it's going to be a mild form, a moderate-severe or severe form, because severe would require, for example, medical evacuation," Muza said. "You look at the costs of doing a medevac in the mountains. You have to use a heavy-lift helicopter. You're running the risk of that helicopter getting shot at, and potentially losing that asset and crew. It becomes a big cost.

"I think we have a chance in the next five years or so of identifying that high-risk group. If we can identify that high-risk group, then we can probably aid them in adapting. You can focus your resources, then, on that individual, rather than treating an entire company."

Though Soldiers might avoid becoming ill, their war-fighting performances could still suffer in the mountains through fatigue, decreased stamina, compromised decision-making and impaired vision, all of which can lead to dangerous outcomes. "Even if we're not talking about altitude sickness, if you look at physical performance, a unit only goes as fast as the slowest person in the unit," Muza said. "Everyone's only going to move as fast as that one individual."

Muza will use everything in his scientific arsenal to keep Soldiers from falling victim to altitude sickness or experiencing decreased performance in the mountains, including acclimatization, diet and medication.

"We're looking for the most efficient and effective approaches to altitude acclimatization," Muza said. "With acclimatization, you function better. You're less likely to develop illness once you're acclimatized, and you're going to have better work performance."

According to Muza, eating a carbohydrate-laden diet can be beneficial at high altitudes. When he goes into the mountains, for example, Muza snacks on crackers.

"We know that with time and altitude, the body uses more carbohydrates for its fuel, and carbohydrates are the most effective fuel at altitude, in fact," said Muza. He added that study subjects who increased carbohydrates "improved their physical performance by nearly 25 percent…so (there's) a very clear benefit of snacking or sipping on carbohydrates while you're on the move. We don't know exactly why."

According to Muza, those findings led to the development of the Modular Operational Ration Enhancement at Natick's Department of Defense Combat Feeding Directorate. MORE is meant for consumption by troops in high altitudes in cold and hot weather.

Muza said that drugs can be used to treat altitude sickness, but they have possible side effects. He added that USARIEM is now focused on drug development at the molecular level. "Possibly, someday you could be sitting at some location, like Fort Bragg, N.C., at 600 feet above sea level, and you can give an entire battalion a pill—maybe not just one, maybe over several days—and they will, in essence, adapt to high altitude prior to deploying to high altitude," Muza said.

Altitude isn't the only concern for Soldiers operating in Afghanistan's mountainous terrain, however. They also must deal with the impact of heat and cold and the possibility of dehydration.

"When you think about mountains, you think about it becoming colder as you go up. But in Afghanistan, you can be fairly high and still warm," said John Castellani, a USARIEM research physiologist. "You could be at 10,000 feet and still have an ambient air temperature in the 80s.

"So now we've got true environmental stressors on the Soldiers. Then you throw on top of that the load they're carrying and everything else."

Castellani did a dehydration study at USARIEM that produced surprising results. "Everybody knows that when you go to altitude, your performance stinks," Castellani said. "Everyone gets it. But when we tell people dehydration affects

you the same way, people don't get it."

While an altitude of 10,000 feet degraded Soldier performance by 12 percent, dehydration of 4 percent resulted in an 18-percent performance decline at sea level. "When we combined the two of them, there was a 33-percent decline in performance, so a third of your performance," Castellani said. "That's such a huge impact."

According to Castellani, dehydration also made acute mountain sickness worse. "It gives us more reasons why the guidance is out there for making sure (Soldiers) try to stay hydrated," said Castellani, adding how important it was for Soldiers to carry enough water. "Soldiers tend to not carry the stuff that deals…with their health more. They will choose…the ammo and other things."

Muza pointed out that commanders now know that their Soldiers should hydrate immediately after helicopter insertions in the mountains. "And we need to rehydrate very substantially," Muza said. "What should you rehydrate with? Water is obviously No. 1, but would there be a benefit to rehydrate with some composition of fluid? Those are the unknowns."

Castellani noted that drawing blood is the only current way to measure hydration. He added, however, that development of a "non-invasive hydration status monitor" is under way.

Cold poses yet another challenge for Soldiers in the mountains. Castellani and others are looking at that, as well. "One of the big (points of) emphasis we're going to have over the next several years is trying to keep the hands functional in the cold," he said. "When it's cold out, you have a hard time doing things. Once you put gloves on, you lose dexterity."

The goal is a system that maintains dexterity but provides warmth. "That's somewhere we're heading," Castellani said.

Muza and Castellani will continue to move forward with their work to make Soldiers more comfortable and effective in the mountains.

"A lot of our work over the last nine years has been much more applied physiology, much more nuts and bolts issues," Muza said. "What can we do for the Soldier now, not 20, 30 years from now?" ❖

A Soldier walks on the treadmill in the altitude chamber at the U.S. Army Research Institute of Environmental Medicine to test his performance. (Photo courtesy of USARIEM)

The altitude chamber at the U.S. Army Research Institute of Environmental Medicine at Natick Soldier Systems Center allows researchers to study how Soldiers will fare when fighting in the mountains of Afghanistan. Here, Ingrid Sils looks on as Dr. Chuck Fulco helps Staff Sgt. Mark Kryskow prepare for a treadmill endurance test. (Photo by David Kamm)

Projections of sickness for servicemembers at high altitudes:

10,000 feet: 25-35 percent
11,500 feet: 50-60 percent
13,200 feet: 80-90 percent
14,800 feet: 90-100 percent

Outfitting the Soldier

Story by Bob Reinert
Photos by David Kamm

From their heads to their toes, if Soldiers wear it these days, the Natick Soldier Research, Development and Engineering Center at Natick Soldier Systems Center, Mass., likely had a hand in developing it.

Scientists, engineers, textile technologists, clothing designers, retired military equipment specialists and experts in other fields at Natick take Soldiers' apparel and equipment quite seriously. They work daily to improve their functionality, durability and comfort. They assist in the design of helmets and body armor, boots and gloves, uniforms and flame-resistant materials. If you can imagine Soldiers wearing it, these professionals are probably trying to improve upon it.

"These are very passionate, dedicated and knowledgeable folks (who) are researching and developing items that our warfighters need to survive, but also will be comfortable wearing," said Jay Connors, division leader, Warrior Equipment and Systems Division at NSRDEC. "They're dedicated daily to doing that. It's ingrained in them.

"They are dedicated in this vein because they want to do the right thing by our Soldiers, Sailors, Airmen and Marines. They want our warfighters to have the best stuff."

Connors is quick to point out that the people at NSRDEC support Program Executive Office Soldier in this quest. "As the life cycle manager, the uniform, from boot to helmet, belongs to PEO Soldier," Connors said. "(These are) their items." What NSRDEC does is provide PEO Soldier with the engineers, clothing designers, textile technologists and chemists to support PEO Soldier's mission of fielding Soldier clothing as well as individual and personal-protective equipment."

Connors, a former Marine reservist, has traveled to Afghanistan three times as an Army civilian and knows firsthand what Soldiers are using. "I was issued quite a bit of gear, to include the (Improved Outer Tactical Vest) and an (Advanced Combat Helmet) for these trips," Connors said. "I wore the gear completely confident that it's the best stuff out there."

His NSRDEC colleagues, including Ben Cooper, share that confidence. Cooper spends a lot of time thinking about what's best for Soldiers' feet as the footwear project engineer in the Footwear Performance Laboratory. The biomechanical and physical analyses performed there have direct application into the development of footwear for Soldiers, special operators, Marines and Sailors.

The FPL literally puts footwear through its paces—testing stiffness, heat insulation, impact, pressure, flexibility and slip resistance. If the shoe fits, it's thanks to the crack FPL staff and a laboratory filled with testing equipment.

"From our perspective here in the lab, we kind of look at the Soldier as a high-performance athlete," said Cooper, himself a former college athlete. "We're keeping that in mind whenever we're working on things for them."

If there's a job that needs to be done by the Army, chances are the FPL has designed footwear to help Soldiers accomplish it. They've turned out waterproof boots, hot-weather boots, cold-weather boots, and blast-protective boots.

"I want the Soldiers to know that we're here working to improve their systems so that they can do their job the absolute best," Cooper said. "Everyone here is working extremely hard to make sure we can satisfy all their needs so that they (don't have to) concentrate on whether or not their equipment's going to fail, and they can concentrate on their mission.

The Army Combat Boot is a tan-colored, temperate weather combat boot with a moisture-resistant, rough-side-out cattlehide leather and nylon duck upper. It contains a waterproof breathable membrane and integrated safety features such as limited fire-, conductive heat- and liquid fuel penetration-protection.

HEAD-TO-TOE

The Soldier Plate Carrier System, when used in conjunction with the Enhanced Small Arms Protective Insert and the Enhanced Side Ballistic Insert, provides National Institute of Justice Level IV+ ballistic protection. The SPCS has adjustable shoulder and side straps to secure a proper fit and to keep the vest in place with minimal shifting during wear. It is compatible with the Soldier's basic fighting load, allowing carriage of essential equipment including M-4/M-16 magazines, a hydration SPCS, squad radio, night vision equipment and comfortable, secure and balanced wear of a day pack or rucksack.

"We get feedback all the time from various Soldiers in the field. Whether it be questions about what boots they can use, what boots should they use, what's available—we're always hearing from the field."

That feedback went directly into development of the Army Mountain Combat Boot with Afghanistan in mind.

"The terrain in certain parts of Afghanistan is pretty extreme and pretty rugged," Cooper said. "Especially in northern Afghanistan, (for) Soldiers traversing mountains and very, very rugged terrain, the Army Combat Boot was not filling all of their needs. It became very apparent that they needed something to fill the capability gap that existed."

The result was a more rigid boot with increased ankle stability. "I think that the Soldiers have been very, very happy with this boot, especially for those (who) are actually in that environment, operating in the mountainous terrain," Cooper said. "We have then continued to try to improve this item."

More recently, the mountain boot lacing system has been modified for enhanced performance. "(Soldiers) wanted something that would lock their laces,"

Cooper said. "So we added a lock lacing system by the comfort notch. This is actually specially designed so when you're lacing the boots, it really locks in there."

Cooper and the FPL won't stop with the mountain footwear. Next up is the Modular Boot System.

"One of the things that we were working to improve is trying to come up with a single system that might be able to fulfill capability gaps that may exist," Cooper said. "This is a three-component system. A Soldier would be issued all three components—two removable liners, an insulated gaiter, and base boot. The base boot would be a hot-weather (flame-resistant) boot."

The system would be capable of operating in dry and wet temperate environments and extreme hot and cold temperatures. "Instead of carrying around a number of different boots, (Soldiers) could have a single system to fulfill their needs in multiple operating environments, and a wide temperature range (minus 65 to 110 degrees Fahrenheit)," said Cooper, adding that the goal is fielding by fiscal year 2013. "I think that people are really chomping at the bit to…get this, and we're working very hard to get the items in the system so that Soldiers can take advantage of it. We're putting a lot of effort into this program right now."

All the recent footwear innovations have helped cut down on lower-leg injuries. "Across the board, all lower-leg injuries, especially for basic trainees, have come down due to the technology incorporated in the boots," said Cooper, who noted between a 10- and 30-percent reduction in injuries.

Change is just as much a constant for Natick clothing designers as it is for Cooper in the footwear lab. And that change comes fast.

"With operations in Iraq and Afghanistan, getting the right equipment to our military men and women is absolutely critical," said Annette LaFleur, team leader for the Design, Pattern & Prototype Team. "The pace at which we design or improve an item and it gets to the field needs to be rapid."

LaFleur's team tailors its work to the operational area. "The physical environment in Iraq and Afghanistan covers all extremes—extreme heat, cold, sand, wind and sun," LaFleur said. "Some operating environments are known for fine sand and/or rugged mountain terrain, so to design with the focus on durability and reparability is key."

According to LaFleur, what the Soldier wears or carries must work as a system. "Therefore, integration is a critical part of the design process," she said. "The goal is to design clothing that enhances the user's ability to perform their mission, quality of life, and protection (and) survivability."

The place and mission, said LaFleur, make the clothes. "There has been an increased focus on incorporating protective flame-resistant fabrics into clothing, consideration of venting or using breathable fabrics or design methods, ballistic and blast protection, and always thinking 'light' when designing or improving an item," LaFleur added.

Connors pointed out that LaFleur, Cooper and others at NSRDEC work together to turn out the best for Soldiers and Marines. "This division is all about collaboration," said Connors, "and as a result, each of the services we support gains better knowledge, better data and the ability to make better decisions because of the synergy within the teams and the rest of the NSRDEC that we and the services have enabled here."

Ultimately, it comes down to getting the best products into the hands of the warfighter, a process in which Connors and his colleagues obviously take satisfaction. "Seeing the uniforms and equipment being worn every day on the news and knowing that you're part of the Army team responsible for the development and fielding of those items," said Connors, "is pretty huge and personally rewarding."

With that in mind, the NSRDEC staff won't let up in its efforts. Connors wants Soldiers to know that.

"To the men and women in the field, you can believe there are people back here…working to make sure you have the best stuff," said Connors, "the right stuff to meet your mission requirements." ❖

The Advanced Combat Helmet is a modular system that weighs less, fits better and is more comfortable than its predecessor. Modular, flame-retardant and moisture-resistant pads act as the suspension system between the wearer's head and the helmet. The cotton/polyester chin strap, a four-point design, allows for quick adjustment and includes a new ballistic protective pad for the neck that adds ballistic protection between the bottom of the helmet shell and the top of the Interceptor Body Armor collar.

The combat glove is fire-resistant para- or meta-aramid, and contains conductive anti-static fiber. The glove is form fitting, offering maximum dexterity, tactility, flexibility and flame and cut protection. The leather palm is hair sheepskin or goat kidskin. The gloves protect the Soldier's hands while moving objects, navigating rough terrain, and during mission operations.

Knee and elbow pads provide dismounted Soldiers with protection for knees and elbows while engaged in tasks that subject these areas to possible injury or discomfort caused by impact, pressure, or protruding objects and debris (rocks, gravel or glass, for example).

Protecting **homeland** defenders

Story by Bob Reinert

MOST people would tell you that lessons learned on the battlefields of Afghanistan don't have much application on American streets. Dave Carney would beg to differ.

As team leader of the National Protection Center at the Natick Soldier Systems Center, he understandably has a different perspective. According to Carney, the NPC works to transfer useful technology and ideas developed at Natick to agencies that secure the homeland. If it worked for a Soldier in Kabul, it just might benefit a local police officer.

"A lot of the products or technologies that are focused on the Soldier or on the warfighter can also be applied to the homeland security side of things," said Carney, a mechanical engineer. "Even though the technology's focused on the military, and the products are obviously designed for the military, the technology can be applied to a lot of other organizations in the emergency-responder community."

Carney conceded that you will probably never see local patrolmen wearing Interceptor Body Armor. "The public wants their police officers to look like police officers," Carney said. "And the police want to look a certain way because they want to come across as being professional and authoritative; but on the other hand, they don't want to appear threatening. They want to be approachable. There is that balance."

Police special weapons and tactics teams are different, however. "A lot of the work that we do lately is with SWAT teams across the United States," Carney said. "They're most closely associated with the Soldier. They're tactical."

According to Sgt. Aaron Washington, commander of the Special Tactical Operations Team of the Massachusetts State Police, his organization has had a 15-year relationship with Natick. "The folks over there are great," Washington said. "They've already done all the testing. They have the knowledge already. That helps us out."

NPC also works with the Department of Homeland Security and the Department of Justice on the personal protective equipment needs for firefighters and law enforcement, including DHS agencies such as the Border Patrol and Coast Guard. "That could be shelter, it could be body armor, that could be rain gear," Carney said. "What we do is help them articulate their requirements. We don't define their requirements—they've got to come up with their requirements.

"Having worked with the military so many years, we know the questions that need to be asked. So we can work with the operators and help them figure out their threats. What environments are you working in? What do you really need, and why do you need it?"

Carney used body armor as an example.

"If you're not getting shot at by armor-piercing rounds, you don't really need body armor to protect you against armor-piercing rounds, of course," said Carney, adding that the Coast Guard and Border Patrol would be exceptions. "Sometimes, they do face those threats.

Salt Lake City SWAT officers conduct operational assessments of body armor and ballistic helmets. (Photo by Matthew Hurley)

So in those situations, you could use some of the protective equipment that the Soldier has. In either situation, there are standards that would define the performance of whatever body armor fits your need, military product specification for the military, and National Institute of Justice Standards for law enforcement."

Sometimes, said Carney, information about the care and handling of equipment might be more useful. "There have been advances in technology, even in regular body armor and how to handle that body armor—how to store it, how to wear it, how to clean it—that we've learned dealing with the military," Carney said. "So it's not just products, it's information that we transfer, as well.

"It's a huge education process, and it's also a challenge. Natick's first customer is the warfighter. If that technology can be applied to someone else, fantastic, but in general, it is not a direct application. It really needs to be tailored to the user because of the differences in the threat."

Chemical/biological threats differ from the battlefield to the street as well. Carney said that while Soldiers are more likely to face chemical/biological warfare agents, first responders probably would be up against hazardous materials.

"Even if a terrorist were to get a hold of some of these chemicals and try to use that as a chemical weapon, it's still not a chemical-warfare agent," Carney said. "You've got to protect them against chemicals. It's just a different kind, in different concentrations, with different lethality, and a different attack method."

The NPC's work isn't all about bullets and chemicals, though. Large wildfires gathered a great deal of media attention again this year, and the NPC is trying to help in the battle against future blazes.

"We're working on a new garment for wildland firefighters," Carney said. "There's (been) a big demand over the years. The population keeps moving out into the wilderness, essentially to get away from the cities. Unfortunately, now the woods (are) burning."

Salt Lake City SWAT officers conduct operational assessments of body armor and ballistic helmets. (Photo by Matthew Hurley)

The NPC handles all that work with a seven-person staff. "Most of us are engineers, and we act as project officers and contracting officer representatives," Carney said. "We've been subject-matter experts in other fields, so we can come in and run these projects, but most times we rely on the subject-matter experts (who) are out in the directorates here at Natick."

Soldiers and first responders share the need to integrate their equipment so that it works well together. Carney and his colleagues have been doing that for years at Natick.

"This is another reason why this work is done up here at Natick," said Carney of the NPC. "This is why Homeland Security and the Department of Justice are coming to us. We've already done this work for the Soldier. We know the thought process that has to go into making all the operator's gear work together."

Information transfer can be a two-way street. According to Carney, NPC usually gets plenty of help from emergency responders around the country when they are running a research and development program.

"When you reach out and ask, 'What are your problems?' and 'Does anyone want to help us with this?' the hands go up," Carney said. "The volunteers come out of the woodwork on these things."

On one project, an online survey was used to collect information about the duty belts worn by all police officers. The NPC was inundated. "Typically, we'll get under 1,000 responses, but for the duty belt, we had over 6,000," Carney said.

Because, as Carney pointed out, many police officers and firefighters are also military reservists or National Guardsmen, they use Natick's technology on the battlefield and often ask for it when they return home to their jobs.

"They see the gear that they are wearing, and then they go back and they're working on the streets of Detroit or Cincinnati or wherever," Carney said. "They do see that there's an opportunity for technology transfer, and they tell the guys that they're working with. That goes up the chain of command there, and I think that's what helps get them that gear."

The biggest obstacle to the flow of technology and information in the future might be monetary, as federal, state and local budgets tighten further. "There's not a lot of money for this stuff," Carney said. "I see a lot of needs and dwindling resources, but I don't have a crystal ball as far as what the future holds."

Carney and the NPC will do everything in their power in the uncertain fiscal landscape to help homeland defenders continue to do their jobs.

"If they're protected, they're more likely to be effective," said Carney, "and they'll be more likely to have a successful mission in the end." ❖

David Kamm

Dr. Paola Pinzon-Arango and Dr. Terri Camesano of Worcester Polytechnic Institute have worked on projects with the Natick Soldier Research, Development and Engineering Center. NSRDEC has relationships with many of the nation's top colleges and universities.

Army teams with academia to assist Soldiers

Story by Alexandra Foran

THE Natick Soldier Research, Development and Engineering Center strives to make sure Soldiers are equipped to be the most effective fighting force possible. Innovation helps meet the challenge. Fortunately for the "Natick Labs," as NSRDEC is sometimes known, there are many close relationships with the nation's top colleges and universities. Through this collaborative process, both parties work together toward the common goal of empowering, enabling and assisting the Soldier.

"The innovation of Massachusetts is fueled by our public and private higher learning institutions. Whether it is WPI or MIT, just to name a few, they not only have bright students, but faculty and research going on that really complements and supports the mission of the (Natick Soldier Systems Center) itself. It is that cross-pollination that can take place that is critical to successful outcomes and product development but also critical to the economy," stated Massachusetts Lt. Gov. Tim Murray.

From the study of spores at the nanoscopic level to enhancing the cognitive performance of the Soldier, and everything in between, NSSC is there alongside many of the most brilliant minds researching, developing and engineering solutions for Soldiers.

Worcester Polytechnic Institute has worked on various projects with NSRDEC. Three distinct projects—the Closures Project, the Bacillus anthracis Spore Project and the Peptides Project—have been collaborated upon most recently.

"The Closures Project is a development which would allow for a non-mechanical closure based on chemical adhesion as opposed to a mechanical closure like the hook and loop design the ACUs have now. Whatever we develop has to be a very strong adhesive," said Dr. Terri Camesano of WPI.

Soldiers work in extreme tempera-

tures, so factors including very high temperatures and high levels of humidity are tested. "We focus on microscopic and even nano-level adhesion using Atomic Force Microscopy," Camesano said. This project involves NSRDEC building different types of chemicals for WPI to test. Thus far, WPI has found that the adhesive is three orders of magnitude greater than the adhesive previously used.

The B. anthracis spore project involves looking closely at the spore coat of the pathogen that causes anthrax. While spores naturally form in the environment and have the ability to persist for hundreds of years, the goal of this project is to understand the rigid protein coat and observe under what conditions the spore can be made vulnerable enough to kill. "When they are in spore form, basically nothing can kill them, because they are so protected by this hard protein coat," said Dr. Paola Pinzon-Arango of WPI.

The Peptides Project, closely connected to the spore project, involves testing antimicrobial peptides, or AMPs (naturally produced small proteins that occur in every living organism), in order to see how they can deactivate spores.

"We study the virulence of B. anthracis when exposed to microphages," said Camesano. (Microphages are small white bloodcells that protect the body by ingesting harmful foreign particles, bacteria and dead or dying cells.) The AFM is a tool that allows the chemical engineers to study the elasticity and morphology of the spore in great detail. They are able to see all that happens to the spore coat when exposed to AMPs and germinants (nutrients).

"As far as we know, no microorganism has developed a resistance to AMPS and, therefore, it is a great way to fight infections or have other applications," said Pinzon-Arango. The peptide used in this experiment comes from a fish's gills. Because fish are exposed to millions of pathogens in their environment and are susceptible to many infections, to fight their infections they produce these specific chrysophsin peptides. "If you could get the person's own cells to start producing the peptide, and then if they had a wound, that peptide would be able to attack the wound or infection on its own," Camesano said.

The ultimate goal for the Army would be to someday use AMPs on fabrics, clothing and packaging to kill any pathogens instantly, regardless what the surface is. This type of revolutionary technology would be beneficial for many medical applications as well. Besides wound healing, hospital surfaces could be coated with AMPs to prevent infection.

The Massachusetts Institute of Technology is currently working on a few research programs alongside NSRDEC that examine learning strategies to enhance the scope and efficiency of Soldier cognitive performance. Outcomes are measured using behavioral and brain indices of cognitive performance including functional magnetic resonance imaging and electroencephalography.

"The future Soldier will face unprecedented physical and cognitive demands that accompany full-spectrum operational capabilities," said Dr. Tad Brunye of NSRDEC. "To successfully face these demands, Soldiers must be fast, adaptable and highly effective thinkers." The capacity to quickly and effectively manage complex and dynamic battlefield information is ideal for any Soldier, but especially for those involved in combat.

At MIT they sought to answer fundamental questions given the study. "Do we have the capacity to know when you are prepared to learn? When is your brain prepared to learn and when is it not?" said Dr. John Gabrieli of MIT. "If we could monitor that, the thought would be maybe we can calibrate that."

The fMRI was used to scan subjects' brains while performing a memory-training task that involved remembering spatial locations. While in a standard hospital, fMRI volunteers were tasked with focusing on multiple indoor and outdoor scenes that flashed for approximately two seconds. Their brains were monitored moment to mo-

"We study the viru
of B. anthracis whe
to microphages."

Spc. Richard Delvecchio

Dr. John Gabrieli of the Massachusetts Institute of Technology is working with the Natick Soldier Research, Development and Engineering Center on areas that could help Soldiers' cognitive performance.

David Kamm

ment throughout the process in order to see how active their brain regions were, especially during the presentation of a different scene. This procedure could be used in the field someday with an EEG that is more easily transported.

"From our viewpoint, we have a big vision about how you can help people be better learners in a world where you are often pushed a lot," said Gabrieli. Training is a huge part of the Army, and the ability to rapidly and effectively train Soldiers is important.

Some of the tasks in these experiments have been designed to resemble some of the tasks that Soldiers face in the field, including keeping their sense of direction in a complicated task such as tracking two people running around in a scene that resembles the Middle East. "They get pretty challenging!" Gabrieli said.

"Prior to these tests, there had not been any objective or scientific measure of when a person is prepared to learn or not in any sense. We did not know it even existed. It's another thing to say scientifically, quantitatively, we can show you that your brain is in a learning state or not."

The outcomes of these various tests will assist training for the military in the future, and this will ultimately allow for the way in which the public learns to evolve as well. "People in the last few years have published a number of papers showing quite strikingly that somewhat extended cognitive training actually shifted people's tests on cognitive abilities that people had presumed were not shiftable anymore," Gabrieli said.

These developments for Soldiers, as well as countless others, could not have been made without the collaborative efforts of the workforce at NSRDEC and the assistance of various colleges and universities not only in Massachusetts, but nationwide. Partnerships like these guarantee ingenuity and create solutions that aid Soldiers' futures, as well as our own. ❖

Alexandra Foran works for Natick Soldier Research, Development and Engineering Center public affairs.

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Staff Sgt. Eduardo Guitron

Staff Sgt. Eduardo Guitron describes himself as an "indomitable Soldier." He is as physically strong as he is mentally strong, but he wasn't always that way. Three deployments left him with doubt and cynicism. A 2009 stint at the Army's Master Resilience Trainer course, part of the Army's Comprehensive Soldier Fitness program, changed that. Not only did Guitron become the Soldier he once was, he became a mentor at the MRT course. Today, he helps other Soldiers acquire the skills they need to better face the stress and challenges of sustained operations. The recipient of numerous awards, badges and tabs, such as the Combat Infantry Badge and Ranger Tab, for his work, Guitron is determined to help his fellow Soldiers be resilient and indomitable.

The nation's strength starts here.


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